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Cranbrook Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective January 1, 2001

Larry Pedersen
Chief Forester

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Cranbrook Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Cranbrook TSA, located in the southeastern corner of British Columbia within the Nelson Forest Region, covers about 1.4 million hectares. The TSA is bounded by the Skookumchuck Valley to the north, the Canada–U.S. border to the south, the Alberta border to the east and the southern Purcell Mountains height-of-land to the west. The major drainage in the TSA is the Kootenay River, which flows southward through the Rocky Mountain Trench.

The Cranbrook TSA includes the cities of Cranbrook, Kimberley and Fernie, and the smaller communities of Sparwood and Elkford. The total population of the TSA is about 47,600 individuals (1996 Census).

The forest industry, other primary industries (mainly mining), tourism and the public sector are the major employment sectors in the Cranbrook TSA. In 1996, the forestry sector accounted for 16 percent of the TSA's total employment. The major forest licensees in the TSA are Crestbrook Forest Industries Limited (now Tembec Industries Inc.) and Galloway Lumber Company Limited.

The Cranbrook TSA is within the traditional territory of the Ktunaxa Kinbasket First Nation. The Ktunaxa/Kinbasket Tribal Council has submitted a comprehensive land claim, which covers the southeast corner of the province, including the Cranbrook TSA. Treaty negotiations are currently at the stage of developing an agreement-in-principle.

Numerous natural resources are associated with the forest land base, including significant wildlife and fish habitats, and tourism and recreation opportunities. Other important resources include range, farmland, and coal and mineral deposits.

The variety of terrain and climate creates an exceptionally diverse environment. Due to the range of habitat types, the area is often described as being unique in North America, given its density and diversity of ungulates and other mammals and birds.

The timber harvesting land base—the area considered available for timber harvesting—comprises approximately 31 percent of the Cranbrook TSA. Twenty seven percent of this area is covered by younger forests from 61 to 80 years of age, which have regenerated following wildfires or harvesting.

History of the AAC

The allowable annual cut (AAC) for the Cranbrook TSA from 1981 to 1987 was 900 000 cubic metres. In 1987, the AAC was reduced to 873 810 cubic metres to reflect a land transfer from the Cranbrook TSA to the Invermere TSA. In 1990, a one-year increase of 376 000 cubic metres was authorized to harvest timber affected by a mountain pine beetle infestation, for a total of 1 249 810 cubic metres per year. After that temporary increase expired, effective January 1, 1991, another increase of 284 000 cubic metres per year was authorized for two years to manage a continuing mountain pine beetle problem. The resulting AAC during that period was 1 157 810 cubic metres. On January 1, 1994, the AAC returned to its previous level of 873 810 cubic metres.

In 1995, due to the addition of the former Tree Farm Licence (TFL) 13 area and associated annual volume of 27 137 cubic metres, the total AAC for the Cranbrook TSA was increased to 900 947 cubic metres.

Effective March 1, 1996, the Cranbrook AAC was reduced by 5.6 percent to 850 000 cubic metres, which is currently apportioned by the Minister of Forests as follows:

Apportionment	AAC (m^3/yr)	% of total AAC
Forest licences	738 752	86.9
Timber sale licences (< 10 000 m^3/yr)	5 672	0.7
Small Business Forest Enterprise Program - all categories	88 458	10.4
Forest Service Reserve	5 000	0.6
Woodlot licences	12 118	1.4
Total	**850 000**	**100.0**

New AAC determination

Effective January 1, 2001, the new AAC for the Cranbrook TSA will be 871 000 cubic metres. Of this total AAC, 838 000 cubic metres is to be harvested from the timber harvesting land base as described and included in the current analysis, and the remaining AAC to be administered as a partition of an annual harvest area as follows:

- 380 hectares per year for problem forest types (see definition below), and
- 230 hectares per year for fire-maintained ecosystem restoration (see definition below).

This determination excludes all woodlot licences issued at this time. This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Partition definitions

***Problem forest types partition*:** leading-lodgepole pine stands that are older than 40 years, less than 19.5 metres tall, and for which at least 5000 stems per hectare are between 2.5 centimetres to 12.5 centimetres diameter (measured at breast height).

Fire-maintained ecosystem restoration (FMER) partition: areas classified as FMER - open range, or FMER - open forest as per the "synthesized ecosystem management units" described in the *Cranbrook Forest District Fire Maintained Ecosystem Adjustment Strategy, March 1998.* These are sites with low timber growing potential as per the criteria in Table A-11 on page 117 of the *Cranbrook Timber Supply Area Analysis Report, December 1999*, on non-productive or non-commercial sites as per the forest inventory, or on existing open range sites as classified in the forest inventory.

Information sources used in the AAC determination

- *Cranbrook Timber Supply Area (TSA) Data Package and Information Report*, British Columbia Forest Service (BCFS), January 1999.
- *Cranbrook TSA Analysis Report and Public Discussion Paper*, BCFS, December 1999
- *Cranbrook TSA Summary of Public Input on Data Package and TSA Analysis Report*, BCFS, March 1999 (draft).
- *Cranbrook TSA Inventory Audit*, BCFS Resources Inventory Branch, 1999.
- *Cranbrook Forest District Fire Maintained Ecosystem Adjustment Strategy*, BCFS, March 1998
- *Cranbrook Forest District Problem Forest Type Summary Report,* BCFS, March 1998
- *Cranbrook Timber Supply Analysis*, BCFS, March 1995.
- *Cranbrook TSA Socio-Economic Analysis*, Pierce Lefebvre Consulting for BCFS Economics and Trade Branch, March 1995.
- *Cranbrook TSA Rationale for AAC determination,* BCFS, January 1996.
- *Cranbrook Forest District Regional Landscape Unit Planning Strategy*, Ministry of Forests, July 1999.
- *East Kootenay Land-use Plan*, Government of B.C., March 1995.
- *Kootenay/Boundary Land Use Plan Implementation Strategy*, Kootenay Inter-Agency Management Committee, June 1997.
- *Kootenay-Boundary Higher Level Plan Order Draft,* June 2000.
- *Forest Practices Code of British Columbia Act*, July 1995.
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, April 1995.
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP.

- *Forest Practices Code Timber Supply Analysis*, BCFS and MELP, February 1996.
- *Supplemental Guidelines for Forest Development Plans*, Cranbrook Forest District, November 1999.
- *Working Paper 36/1998, Site Index Adjustments for Old-Growth Stands Based on Veteran Trees,* Nigh, G.D., BCFS Research Branch, 1998.
- *Working Paper 37/1998, Site Index Adjustments for Old-Growth Stands Based on Paired Plots*, Nussbaum, A.F., BCFS Research Branch, 1998.
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province.
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources.
- Letter from the deputy ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives for achieving acceptable impacts on timber supply from biodiversity management.
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the MOF and MELP, including the AAC determination meeting held in Cranbrook, April 5 and 6, 2000.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as existing timber volumes, the rate of timber growth, and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. Many of the factors used as inputs to timber supply analysis are uncertain due in part to variations in physical, biological and social conditions. Ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the relevant social, cultural and economic factors when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Cranbrook TSA, I have considered known limitations of the technical information provided, and am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the Forest Act requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to *increase* the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or factors that could work to *reduce* the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the Forest Practices Code.

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

As British Columbia progresses toward the completion of strategic land use plans, the eventual timber supply impacts associated with land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

In the Cranbrook TSA, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP), and decisions on protected areas have clarified many aspects of land and resource use and management. The pending designation of the KBLUP Higher Level Plan will provide further certainty regarding resource management in the area (see Kootenay-Boundary Land Use Plan section).

Forest Renewal British Columbia funds a number of intensive silviculture activities that could have the potential to affect timber supply, particularly in the long term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are

available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are superior to those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Cranbrook TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review program for TSAs and TFLs.

For each AAC determination for a TSA, BCFS staff carry out a timber supply analysis using an information package including data and information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (FSSIM—"Forest Service Simulator"; in this case for the Cranbrook TSA, version 3), a series of timber supply forecasts are produced reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one forecast is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. Often termed the "base case," it serves as a reference forecast and forms the basis for comparison when assessing the implications of uncertainty for timber supply.

Because it represents only one of many theoretical forecasts and incorporates information that has some uncertainty, the reference forecast for a TSA is not an AAC

recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, many of the following considerations examine the degree to which all the assumptions made in generating the reference forecast are realistic and current, and the degree to which the resulting predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are based on informed judgement, using current, available information about forest management. Such information may have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

The timber supply analysis is integral to the considerations that lead to the AAC determination. However, the AAC determination itself is not a calculation. Rather it is a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed.

Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the reference forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by a computer analysis of the combined considerations to confirm the exact AAC determined.

Base case for the Cranbrook TSA

The base case in this timber supply analysis incorporates several changes from the base case that was generated in the analysis used in the 1996 AAC determination. In overview, it includes changes to reflect the following:

- the Forest Practices Code is now factored in more fully with improved accuracy (only forest cover constraints were applied for riparian and stand-level biodiversity in the previous analysis)
- the update of the forest inventory for recent disturbances for the entire TSA, including the previous TFL 13 area
- government's approval of the Kootenay-Boundary Land Use Plan, which provides direction for resource management in the region
- changes in modelling to reflect greater recognition of inoperable forests in achieving objectives for values other than timber
- a re-evaluation of problem forest types based on an expert inventory
- changes to defining the minimum harvestable ages
- changes to accounting for recreation values, and
- a lower estimate of unsalvaged losses

With these and other appropriate factors incorporated, a base case forecast was generated and submitted for public review. The base case forecast showed that the current harvest level (after accounting for 12 000 cubic metres issued to woodlot licences) of 838 000 cubic metres could be maintained for 13 decades. This was followed in the next decade by a 10-percent decline to 754 000 cubic metres for 5 decades. Then the steady long-term harvest level of 883 000 cubic metres was reached in about 20 decades.

As discussed in the following considerations and with the qualifications there expressed, I am satisfied that the base case projection provides a suitable point of reference for my assessment of the timber supply for this AAC determination.

Consideration of factors as required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account
(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvest

- general comments

The total area of the Cranbrook TSA, as reported in the December 1999 timber supply analysis, is 1 410 235 hectares. Of the total TSA area, 774 253 hectares (about 55 percent) are classified as productive Crown forest land.

In defining the timber harvesting land base for the Cranbrook TSA (i.e., the area estimated to be economically and biologically available for harvesting), a series of deductions were made from the total productive forest area. These deductions account for factors that effectively reduce the suitability or availability of the productive forest for economic, ecological or social (e.g., parks) reasons. In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors before quantifying appropriate amounts of areas to be deducted from the productive forest, in order to derive the timber harvesting land base.

In the Cranbrook TSA, areas were deducted from the productive forest to account for many factors including roads, trails and landings; riparian reserves; sensitive soils; areas of low productivity; excluded forest types; and inoperable areas. The deducted areas are detailed in the analysis report, and summarized in Table 2 of the report.

- physical and economic operability

Those portions of the TSA that are not physically accessible for harvesting, or that are not feasible to harvest economically, are excluded from contributing to the timber harvesting land base. In addition—based on slope information found in the inventory file—areas within the operable land base on slopes greater than 65 percent with predominately

lodgepole pine and on slopes greater than 70 percent for other species were excluded from the timber harvesting land base.

To assess the size of the timber harvesting land base, operability was originally mapped in 1987. Since that time joint BCFS and licensee reviews have resulted in some site specific adjustments to the operability maps. In the analysis, after accounting for other land base deductions, about 88 691 hectares were deducted from the productive forest to account for inoperable areas.

In preparing information for my consideration, district staff examined two drainages where they were concerned about assumptions regarding operability. These sites were the Hellroaring Creek and Redding Creek drainages. In these drainages they found approximately 4050 hectares (about 1 percent of the total timber harvesting land base) at higher elevations, often on steeper slopes, were not being accessed even though logging had occurred in these drainages for the past 30 years. Staff submitted that this trend occurs on up to 5 percent of the total timber harvesting land base.

Given the significance of this concern, I undertook a reconnaissance of these drainages by helicopter, accompanied by district staff. We observed that harvesting activities have occurred on various elevations and slope conditions. Overall from the field examination, my impression was that the operability assessment used for the analysis is still reasonable except for some uncertainty about the upper slopes where harvesting has not yet been consistently demonstrated.

A sensitivity analysis, which examines the risk to timber supply if the timber harvesting land base was decreased by 5 percent, shows no impact to the base case harvest level for 4 decades. While I believe there is some range of uncertainty, extrapolating from Hellroaring and Redding to the rest of TSA likely represents the upper range and therefore the sensitivity analysis may overestimate the magnitude of risk.

A number of public submissions raised concerns about operability. The East Kootenay Environmental Society (EKES) stated that due to recent downturns in the timber and pulp markets, operability is overly optimistic. The Ministry of Environment, Lands and Parks (MELP) noted that the licensees have been avoiding the steeper slopes and now there is a backlog of these types of areas.

Crestbrook Forest Industries (Crestbrook) submitted that—based on field measurements—harvesting has occurred in Douglas-fir leading stands on over 70 percent slopes and in lodgepole pine stands over 65 percent slopes. While district staff agree that harvesting practices that pre-dated current standards did occasionally occur on steeper ground, they examined 1998 forest development plans and generally found no proposed harvesting of these types of stands in steeper terrain. If these sites are harvested in the future and hence included in the timber harvesting land base, then the timber supply impact as shown in a sensitivity analysis indicates only a small increase in the projected long-term timber supply.

From my observations during the field trip, I agree that harvesting has occurred in some of the higher elevations. However, I expect to see more consistent harvesting of these higher elevation stands if they are to continue to contribute to the timber supply in the future.

Although the timber supply is not overly dependent on harvesting these types now, these areas must be developed so that future harvesting is more dispersed across various bands of elevations. To improve confidence in the assessment of operability, I suggest that licensees prepare a total chance plan that reflects a more dispersed harvesting pattern and leads to more demonstrated performance in these difficult areas.

I have reviewed the points raised and understand that there is some degree of uncertainty about operability. However, there is no conclusive evidence upon which to adjust the size of the timber harvesting land base for operability. Before the next determination, I urge the district staff and licensees to review operability and refine the mapping in consultation with local stakeholders. For this determination, I note that the magnitude of the uncertainty does not create a risk to the short-term timber supply but could represent a risk in the mid- to long term. I have considered this in my determination as discussed under "Reasons for decision."

- low productivity sites

In the timber supply analysis, after accounting for other land base deductions, about 38 500 hectares were defined as having characteristics that exhibit a low potential for timber productivity and were therefore excluded from the productive forest land base. The criteria used to exclude these areas was based on a range of slope gradients and minimum site indexes (estimated tree height at 50 years). The criteria ranged from a minimum site index of 8 metres for species such as spruce on all slopes up to a minimum site index of 13 metres for Douglas-fir leading on slopes greater than 40 percent. Harvesting operations have not occurred on these lower productivity sites. In general and in consideration of other areas in the province, I find the criteria for minimum site indexes to be reasonable. For this determination, I accept the assumptions for low productivity sites as reflected in the analysis.

- environmentally sensitive areas

An environmentally sensitive area (ESA) is an area identified during a forest inventory that is sensitive to disturbance (such as unstable terrain, or areas that are difficult to reforest) and/or is significantly valuable for fisheries, wildlife, water or recreation resources. ESA values are used to exclude areas from the timber harvesting land base where more specific and detailed information is unavailable about a particular forest resource. Areas can be identified as either very sensitive (E1) or moderately sensitive (E2) to disturbance, and are either entirely or partially removed from the timber harvesting land base, according to their level of sensitivity.

In deriving the timber harvesting land base for the Cranbrook TSA timber supply analysis, 112 541 hectares, or 14.5 percent of the productive forest, were excluded for ESAs. Exclusions for sensitive soils were based on detailed operational information from original inventory work for the TSA done in the early 1970s. Terrain stability assessments have been completed at the drainage level for some areas where operations are occurring or planned, as required by the *Forest Practices Code of British Columbia Act* and *Regulations*, but not for the whole TSA.

The exclusions applied for various environmental sensitivities were as follows. Areas with highly unstable soils (Es1), avalanche risk (Ea1), hydrologic sensitivity (Eh1), or regeneration problems outside of the Rocky Mountain Trench (Ep1) were 100-percent excluded. Areas with moderately sensitive soils (Es2) within community or domestic watersheds were reduced by 50 percent. Land base exclusions were not applied for recreation or wildlife habitat; instead the necessary restrictions were applied through forest cover constraints. This topic is discussed, together with the views expressed by MELP staff, under Integrated resource management objectives.

In the previous determination, concerns were raised about the assumptions regarding ESAs. I requested staff to examine this issue. In preparation for this determination, the staff and the regional geomorphologist examined the terrain stability mapping on six mapsheets they felt were representative of the TSA and compared them to the ESAs for soils as reported in the forest inventory. The review shows a trend of underestimating the size of the timber harvesting land base by about 1 percent due to using ESAs in the forest inventory rather than terrain stability mapping.

Input from the forest industry also suggests that ESAs are overestimated. On the other hand, MELP and EKES expressed concerns that environmentally sensitive areas are not sufficiently accounted for.

The review of the terrain stability mapping indicates that reductions for sensitive soils may be overestimated but it is unclear how the area overlaps with other ESAs such as areas identified with regeneration problems. However, having examined the issue and the methodology employed in the geomorphologist's review, it is reasonable to expect the overestimation to be less than 1 percent. I have accounted for this potential underestimation of the timber harvesting land base as discussed under "Reasons for decision."

- excluded forest types

In the Cranbrook analysis, a total of 28 635 hectares were excluded from contributing to the timber supply due to low merchantability or difficult reforestation conditions. These types include older redcedar and hemlock, older balsam, deciduous and all high elevation parkland forest.

In the 1995 analysis, a percentage reduction that ranged from 10 to 100 percent was applied to a broader definition of non-merchantable stands. In the 1995 analysis, approximately 43 100 hectares of older decadent stands were deducted, while in the 1999 analysis only 7733 hectares of these older stands were deducted. Although the deductions reported in the 1995 and 1999 analyses are not directly comparable—as the two analyses used a different sequence of land base deductions—they provide an indication of the outcome from a change in approach. Both analyses had deductions for high elevation parkland.

For the 1999 analysis, Crestbrook questioned the removal of older redcedar, hemlock and balsam stands because they state that these stands can be found on very productive sites, which can be harvested and successfully regenerated when the price for pulp fibre is high.

In addition, they expressed concern that nearly 13 000 hectares of high elevation parkland were removed.

Staff explained that although some harvesting (about 30 hectares) has occurred in the high elevation parkland areas over the past 10 years, none has occurred in the past five years. It was acknowledged that current forest development plans show about 98 hectares are planned for harvesting in these high elevation parkland areas over the next five years. However, the past harvesting only occurred due to their proximity to more productive stands and as a minor component of a cutblock.

I consider the exclusion of parkland areas as appropriate until harvesting and successful forest management can be demonstrated on these sites. However, I am concerned that due to the revised methodology for accounting for marginal decadent stands, more of these types may now be contributing to the timber supply than is reasonable. Staff assured me that the revised approach was an improvement over the past and reflective of current performance. Nonetheless, more decadent forest types are now included in the timber harvesting land base. How this factor might overlap with the 38 500 hectares deducted for low-timber productivity and the additional 21 700 hectares for problem forest types as discussed next, is unclear. Before the next determination I request that district staff further review the appropriate level of inclusion of these decadent types and consider their overall economic viability. For this determination I have made no further adjustments for excluded forest types.

- problem forest types

In addition to the preceding deductions for inoperability, low productivity sites and excluded forest types, a deduction was applied to account for problem forest types. Only portions of stands defined as problem forest types—marginally economic sites of leading-lodgepole stands either pure or mixed with other species, and a small area of leading Douglas-fir and ponderosa pine—were deducted for a total of about 21 700 hectares. In addition, the minimum harvestable age for 16 101 hectares of marginal stands that contribute to the timber harvesting land base was increased by 20 years to allow sufficient time to achieve minimum merchantability criteria.

Interest has been expressed to utilize problem forest types for postwood, and occasionally for pulpwood. In 1998, an evaluation of the problem forest types showed that about one-half of these stands—on slopes less than 40 percent, with moderate density (between 5000 and 10 000 stems per hectare) and heights between 13 metres and 19.5 metres—meet the criteria for postwood operations. Staff believe that harvesting and rehabilitation of these sites could improve habitat quality and biodiversity, as well as increase site productivity. If these stands were rehabilitated over a period of 30 years, the annual area harvested would be about 380 hectares per year. The regenerated stands on these sites would result in a more vigorous and productive stand in approximately 70 to 80 years. This could eventually lead to an improved long-term timber supply.

District staff advise me that due to the very low merchantability of these existing stands, it is difficult to determine an accurate merchantable volume that meets current utilization and grade standards. A rough estimate of the average volume per hectare is about 80 cubic metres per hectare (if measured at a utilization standard of 12.5 centimetres diameter at

breast height). This would produce an annual harvest level of about 30 000 cubic metres over a 30-year period. If the average diameter of utilized material were to be reduced, even more volume would be recovered from this same area.

District staff indicated that a small area (less than 1000 hectares) of leading Douglas-fir stands has limited merchantability due to *Armillaria ostoyae* (armillaria) root disease problems, which was not directly accounted for in the analysis. However, some of these stands overlap with the fire-maintained ecosystem restoration program, as discussed later.

EKES raised concerns that problem forest types were insufficiently accounted for as industry is avoiding these types. They propose that the harvest level should be partitioned so that licensees can demonstrate that this type of wood is suitable for harvesting.

I find that the district has undertaken a substantial amount of work to examine the problem forest types. Results indicate there are possible opportunities to utilize and rehabilitate these densely-stocked lodgepole pine stands. I have considered the results of the Cranbrook postwood study to represent an additional timber supply to the base case forecasts, as discussed further under "Reasons for decision."

- roads, trails and landings

To estimate the amount of area covered by existing roads, trails and infrastructure right-of-ways (powerlines, highways, natural gas lines, and railroads), the length of each feature was multiplied by the average right-of-way widths for each of these features. The total area removed for these existing features was 10 860 hectares. However, subsequent to the analysis, district staff advise me that about 540 hectares of additional existing roads were not mapped at the time of the analysis and should therefore be considered as a further reduction.

In addition, productivity losses due to existing skid trails, landings and other disturbances within existing cutblocks were estimated to be about 5.8 percent and 3.7 percent, respectively, for a total of 9.5 percent.

Future roads, trails and landings were considered to reduce future productivity by about 7.9 percent, which included 3.7 percent for future roads and 4.2 percent for future landings and other disturbance losses. These areas were accounted for by a one-time area reduction to stands currently older than 30 years. Upon further examination, staff feel that the reduction factor of 3.7 percent for productivity losses due to future roads could be overestimated, and is probably closer to 3.2 percent. However, I note that any overestimation of future productivity losses is a small amount and is really a long-term issue that will not affect the short-term timber supply.

Although I noted several concerns raised in the public input regarding the deductions, I found that the district had undertaken a very detailed and comprehensive approach to this factor. The approach was based on the regional pedologist's estimate of current practice. I discussed the methodology with the district staff and found the reduction factors to be reasonable.

In summary, for this determination I have accounted for the underestimation of 540 hectares for existing roads, trails and landings as discussed further under "Reasons for decision."

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to exclude the areas and timber volumes allocated to woodlot licences.

In the analysis, all areas classified as woodlot licences, with an associated harvest of 11 746 cubic metres per year, were not included in the projections for timber supply. Since the time of the analysis, an additional 372 cubic metres per year have been added to the woodlot program. As the woodlot area has been appropriately excluded from the timber harvesting land base and the additional volume is minor, I do not consider it necessary to make further adjustments for woodlots, beyond what was reflected in the analysis assumptions. However, I will discuss the accounting for woodlot licences further under "Reasons for decision."

- *Christmas tree permit areas*

Since the 1980s, the area under permit for Christmas trees has been reduced as licences are not replaced upon expiry. Areas that are covered by active permits do not contribute to the timber supply. However, as the licences expire, the areas are reclassified and become part of the timber harvesting land base. About 432 hectares of expired permit area have not been accounted for in the analysis. I have accounted for this additional timber harvesting land base in my determination as discussed under "Reasons for decision."

Existing forest inventory

- *current inventory*

The forest inventory data used for the timber supply analysis was based on a re-inventory of the Cranbrook TSA that was completed in 1990–1991, using 1988 aerial photography. The inventory was updated to 1996 to account for harvesting disturbances and silviculture treatments.

To address uncertainties raised in the last AAC determination, I directed BCFS staff to update the forest inventory for the portion of the TSA previously administered under TFL 13, and for insect- and disease-attacked areas. I also directed them to complete an inventory audit of the Cranbrook TSA to discern if discrepancies could be found in the volume estimates for existing stands. Although the area previously covered by TFL 13 was not re-inventoried due to funding shortages, the inventory for this area was updated to 1996 to account for recent disturbances and incidences of insects and disease.

In 1998, an audit was completed for the Cranbrook TSA on the mature, immature and non-forest components of the inventory. The audit found no significant problems with forest cover labeling or volume estimates. I will further discuss the results of the audit under *volume estimates for existing stands* and *site productivity estimates*.

The audit did not sample partially harvested cutblocks. Staff expressed concern that the forest inventory does not reflect the reduced stand volume in areas where partial harvesting has occurred. Two approaches are available to reflect partial harvesting in the forest inventory. One approach is to lower the crown closure percentage and the other is to reclassify the area with a stocking class 'R' (mature stands where 26 to 75 percent of the area and/or volume has been disturbed). However, volume projections are not particularly sensitive to crown closure adjustments in the forest inventory, and stocking class 'R' has not been utilized in the forest inventory for the Cranbrook TSA. This issue will also be discussed next, under *volume estimates for existing stands.*

I have considered the existing inventory to represent the best available information regarding current forest inventory. I am satisfied that the data used in the timber supply analysis forms a suitable basis for this determination.

- volume estimates for existing stands

The Variable Density Yield Prediction (VDYP) model version 6.5a, developed and supported by the Ministry of Forests Resources Inventory Branch, was used to estimate timber volumes for existing natural stands older than 30 years for the timber supply analysis. In the previous AAC determination, district staff were concerned that the mature stand volumes were possibly overestimated. However, the inventory audit completed for the Cranbrook TSA reported that the volume estimates for the mature component of the inventory are statistically acceptable. Subsequent analysis of stratified data showed similar levels of acceptability for volume estimates in the operable forest areas.

A few submissions from the public stated that even though the conclusion in the audit did not report any significant discrepancies, it did show a lower mean volume per hectare. However, from the 50 sample plots, I find that the audit mean volume strongly correlated to the inventory mean volume. The objective of the Cranbrook TSA Inventory Audit was to provide confidence in the inventory for either showing statistical accuracy, which it has, or to set priorities for further work.

The inventory audit did not sample stands that have been partially harvested. Most of the 24 900 hectares of partially harvested stands reported in the forest inventory files are labeled with a stocking class of '0' or '1' (indicating immature and essentially undisturbed mature stands). In the analysis, this classification did not result in reflecting lower existing stand volumes to account for partial harvesting. Staff estimated that on average, partial harvesting removes approximately 40 percent of the stand volume. This equates to approximately 60 cubic metres per hectare having been removed during past partial harvesting, which results in a total volume overestimation of about 1 490 000 cubic metres for the entire TSA. As reported in the analysis, the total current growing-stock volume is approximately 53 000 000 cubic metres, and therefore the volume for existing stands within the TSA may be overestimated by about 2.8 percent, due to the overestimation of volume on the partially harvested areas.

Although the audit results have validated the inventory volumes as reliable for strategic planning purposes, I am concerned about volume estimates for the partially harvested areas. As noted below under 'Implementation,' data should be collected to resolve questions about the volume estimates for partially harvested stands. I have considered the

risk to timber supply from this uncertainty as discussed under "Reasons for decision." Apart from this uncertainty, I am satisfied that the timber supply analysis has used the best available information for existing stand volumes.

Expected rate of growth

- volume estimates for regenerating stands

For the Cranbrook TSA timber supply analysis, the Table Interpolation Program for Stand Yields (TIPSY) was used to estimate the growth and yield of all future regenerated stands. As well, TIPSY was applied to all existing stands less than 30 years old. For the majority of stands less than 30 years old, except for 30 percent of pure lodgepole pine and 50 percent of leading pine regenerating stands, stands were assumed to be spaced to target densities.

Operational adjustment factors (OAFs) were applied to adjust the projected yields generated from TIPSY to reflect operational conditions. The factors are 15 percent for OAF 1 (a reduction to account for incomplete site occupancy, or small gaps in a stand), and 7 percent for OAF 2 (a reduction to account for pest, disease and decay losses). The OAF 2 reduction is slightly higher than the typical provincial estimate of 5 percent. An additional 2 percent reduction was applied to account for estimates of armillaria root disease losses. The estimate was based on a study completed in Salmon Arm. However, more recently, the Nelson forest regional staff have analyzed losses and believe they are possibly even higher. Currently work is underway using Prognosis BC (a sophisticated growth and yield model) and data from stands in the region with moderate to low levels of armillaria. Preliminarily results indicate that the average reduction factor for stands within the Cranbrook TSA could be closer to 4.8 percent. Therefore, an additional reduction of 2.8 percent may be necessary to account for armillaria losses in regenerating forests. I have taken this additional potential loss into account in my 'Reasons for decision'.

In FMER-open range areas (FMER-OR)—forested areas or partially forested areas that are planned to be restored to open range after first harvest—existing stand volumes were assumed to be initially available for harvest and then the area (about 19 659 hectares) no longer contributed to the timber supply. As a result, there was no assumed regenerated stand yield contribution from these areas. The FMER-OF areas (about 39 160 hectares) were assumed to be managed one-half for forage and one-half for timber. To reflect this in the analysis, the assumptions were as follows: 32.7 percent volume reduction for wildlife trees and patches, lower stocking density, longer regeneration delay of 50 years, and the application of OAFs. District staff consider that in aggregate these assumptions reflect the KBLUP objectives for these lands.

The district staff advised me of their concerns regarding the availability of growth and yield tools to project future stand yields, while accounting for specific issues like uneven-aged management, disease and insects, and either very low or high-density stands. Regenerating stands on about 38 000 hectares harvested prior to 1983 are of concern as many of these stands are being overtopped by competing vegetation and/or are often in the lower range of acceptable stocking levels. About 40 percent of young lodgepole pine stands (about 14 000 hectares) up to 40 years old have been affected by rusts, needle casts

and/or pitch moth for the last 4 to 7 years. In addition, about 35 450 hectares are located on higher elevation sites and assumptions regarding regeneration delays, stocking levels and growth rates may be optimistic.

In total, these concerns could potentially mean that regenerating younger stands on about 20 percent of the timber harvesting land base are not performing to the levels projected by TIPSY. To review the risk to timber supply projections due to this concern, I have examined two sensitivity analyses. One sensitivity analysis showed that if regenerated stand volumes were decreased by 10 percent the harvest level could be maintained for 6 decades and not 13 decades as shown in the base case. The other sensitivity analysis showed that if all regenerated stands were assumed not managed and projected on VDYP curves, the harvest level could be maintained for 5 decades before declining to a lower long-term level.

I note that staff have raised a significant issue regarding the uncertainty of future regenerated stand volumes on about 20 percent of the timber harvesting land base. Nonetheless, since there was accounting in the analysis for some future losses through the OAF reductions and extended rotations for some stands, I feel the sensitivity analysis that reflects all volumes projected by VDYP serves to bound the lower range of uncertainty and shows that the potentially negative implications mainly impact mid- to long-term harvest levels. I have accounted for this risk to timber supply as discussed further under "Reasons for decision."

- site productivity estimates

Inventory data includes estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced in regenerated stands and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, in British Columbia, site indexes determined from younger stands (i.e., less than 31 years old) and older stands (i.e., over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been managed for stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This assumption has been verified in several areas of the province where studies—such as the old-growth site index or OGSI project—suggest that actual site indexes may be higher than those indicated by existing provincial data from old-growth forests. In recent years it has been consistently concluded from such studies that site productivity has generally been underestimated; managed forest stands tend to grow faster than projected by inventory-based site index estimates from old-growth forests.

However, staff raised that the concern that although provincial OGSI results may indicate an underestimation of tree growth on many sites, forest research (The Forestry Chronicle March/April 1996, Vol. 72 No. 2; *Height growth-elevation relationships in subalpine*

forests of interior British Columbia; K. Klinka, Q. Wang, R.E. Carter and H.Y.H. Chen) reports reduced height growth with increasing elevations and/or increasing latitude for subalpine forests in British Columbia's interior.

As reported in the Cranbrook analysis, high elevation sites account for about 8 percent of the timber harvesting land base. To examine the concern regarding the possibility of lower productivity on high-elevation sites, staff reviewed the potential impact to timber supply if yields have been overestimated for these sites. Although not directly linked to forest research, a sensitivity analysis showed that if yield estimates for high-elevation sites were overestimated by 30 percent, the base case harvest level could be maintained for 50 years, and in the long term could be about 3 percent less.

Crestbrook noted that the results from the provincial OGSI studies were not applied in the base case, but that an adjustment could offset any potential overestimation of growth in high-elevation stands (over 1800 metres). I am not aware, apart from the provincial OGSI studies, of any specific local site productivity studies that have been undertaken in the TSA. However, I note that on the timber harvesting land base in the Cranbrook TSA, about 90 percent of the stands are less than 150 years old and 60 percent are classified as growing on sites with medium productivity. Therefore, as most stands are younger than 150 years, the inventory is more likely to accurately reflect potential site productivity and hence the provincial OGSI results may not apply.

For the immature component of the inventory audit, out of the 20 stands sampled, the inventory correctly identified site index to within 3 metres for 14 stands. The audit results conclude that the inventory has an acceptable level of accuracy for the site index assignments for existing young stands.

For many areas of the province, I generally conclude that site productivity has likely been underestimated. However, given the concern noted in the previous section, and given the relatively young age-class structure of the Cranbrook TSA, as well as the fact that the OGSI results apply to older-age stands, I am unable to conclude that there is a likelihood of an underestimation of site productivity. Nonetheless, I note there is uncertainty regarding overestimation of site productivity for future managed stands on higher elevations. If studies provide adjustments appropriate for this TSA, I will account for them in future determinations. For this determination, I have considered the site indexes as reported in the forest inventory to represent the best available information and I have made no further adjustments for this factor.

- minimum harvestable age

A minimum harvestable age is an estimate of the earliest age at which a forest stand has grown or will grow to a harvestable condition. The minimum harvestable age assumption mainly affects when second growth will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of harvestable timber may be maintained.

For the Cranbrook TSA analysis, the minimum harvestable ages for stands in each analysis unit were generally assumed to be the greater of: the age required to achieve a minimum merchantable volume per hectare; the age at which 250 of the largest diameter trees

achieve a prescribed minimum mean diameter at breast height (dbh); or an age that is within 95 percent of the culmination of mean annual increment (CMAI). For some stands on poorer sites, professional judgement was used to lower the ages obtained from the above criteria. In most cases, achieving 95 percent of CMAI was the overriding factor; next was the minimum mean diameter. The resulting minimum harvestable ages ranged from 55 years for some good productivity sites to 175 years for some poor sites on steeper slopes. District staff support the criteria as applied in the base case as their current estimation of minimum harvestable ages, and I do not find them unreasonable.

The EKES suggested that while the criteria was reasonable, 100 percent of CMAI should be achieved, and not 95 percent. They submitted that this would tend to maximize the long-term volumes and increase wildlife habitat retention. Also, they stated they are unaware of a policy in British Columbia that supported economic rotations. Crestbrook questioned the application of 175 years for pine on the steeper, poorer sites and suggested that it should be lowered to a biologically achievable age, particularly given the high susceptibility to mountain pine beetle attack at such older ages.

A sensitivity analysis shows that if the minimum harvestable ages were increased by 10 years the timber supply would decline in decade 4 for about 9 decades, then increase to the same long-term harvest level as the base case. If the minimum harvestable ages were set at culmination (CMAI) the timber supply would decline after 1 decade, but would increase in the long term.

District staff discussed the correlation between spacing densely-stocked stands and the minimum harvestable ages. Their concern was that if adequate juvenile spacing is not undertaken then trees will likely not achieve the minimum diameters as soon as currently projected and hence the minimum harvestable ages will be longer.

Determining the right minimum harvestable age or the precise bounds for minimum harvestable ages is difficult. However, I do not believe that simply applying culmination as the minimum harvestable age always represents the right approach. The harvestable ages are minimums and in the analysis, stands are generally projected to be harvested at older ages than the minimums due to forest cover requirements and a host of other constraints. Given current assumptions reflected in the base case, stands are projected to be harvested initially at an average age of 160 years. Average harvest age then declines to 110 years by the third decade and thereafter ranges from 90 to 130 years.

I note the high degree of timber supply sensitivity in the analysis when the culmination age is applied. If the minimum harvestable ages assumed in the base case are not reflective of actual practices, then the consequences could represent downward pressures on timber supply. I appreciate the difficulty of predicting future harvestable ages and I expect that staff will continue to revise and improve assumptions over time. However, for this determination, staff confirm that the criteria for minimum harvestable ages are a suitable approximation. As no further precision has been brought forward for adjusting the minimum harvestable ages and I find the ages reasonable, I conclude there is no risk in accepting the minimum harvestable ages assumed in the analysis for this determination.

(ii) the expected time that it will take the forest to become re-established on the area following denudation:

Forest re-establishment

- regeneration delay

Regeneration delay is the elapsed time between the harvesting of an area and when it becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, prompt reforestation was assumed with regeneration delays ranging from 2 to 3 years—2 years for natural regeneration and 3 years for plantations (includes 1 year for age of planting stock).

The licensee submission stated that while they agree with the 2 years for natural regeneration, they consider the 3 years for planted areas to be high, given the additional 1 year for the age of planted seedlings. I understand that the 3 years is an average and therefore actual delay time will vary greatly for individual stands, which may be shorter or longer. I am advised that the timber supply forecast is not sensitive to increasing or decreasing the assumed regeneration delay periods by up to 2 years in the short term, and only affects the timing of the transition to the long-term harvest level. Therefore, while the exact length of actual delay periods may vary, I am satisfied that the assumptions in the analysis are adequate for this determination.

- not-satisfactorily-restocked (NSR) areas

Not-satisfactorily-restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered "current" NSR. Where a suitable stand has not been regenerated and the site was harvested before 1987, the classification is "backlog" NSR.

The current Cranbrook TSA forest inventory file, updated in 1998, identifies almost 29 543 hectares as current and backlog NSR. However, the integrated silviculture information system (ISIS) and the major licensee silviculture information system (MLSIS) summaries, which were more up-to-date at the time of the analysis, identified about 5380 fewer hectares than in the inventory file. About half of those 5380 hectares were classified inoperable. Staff have reviewed this factor and now report only 22 722 hectares of total NSR. They estimate that approximately one-half of the difference of 6820 hectares remains to be restocked over the next 10 years. The remaining half (3410 hectares) is inoperable and should not contribute to the timber supply.

Crestbrook feels that although replanting efforts may not be economical on 2690 hectares, as reported in the analysis, these areas are productive and will reforest naturally over time. Therefore, they suggest that these areas should contribute, though with a longer regeneration delay of 30 years.

In the analysis, half of the 5380 hectares (2690 hectares) was considered inoperable and excluded from the timber harvesting land base. However, staff now suggest the area is closer to 3410 hectares, as a further 720 hectares should be excluded. A certain amount of

the inoperable NSR land is likely to be productive and reforest over time. On the other hand, some of it may not be suitable for future forest management and harvesting again without further forest management intervention. I would like staff to examine this area to determine its future potential and appropriate contribution to the timber harvesting land base in the long term. For this determination, I have considered this situation as a slight overestimation of the timber harvesting land base by an amount which is likely less than 1 percent. I have accounted for this in my determination as discussed further under "Reasons for decision."

(iii) silvicultural treatments to be applied to the area:

Silvicultural systems

As reflected in the analysis, the main silvicultural systems in the Cranbrook TSA are clearcutting and clearcutting with reserves. Other types of systems include seedtree, shelterwood and partial cutting. Staff estimate that approximately 11 percent of recent harvesting was done by partial cutting where only lodgepole pine was removed from mixed species stands, or where other variations of selection harvesting were applied. The annual area harvested using partial harvesting systems has decreased since the time of the 1995 analysis, and less partial harvesting is now occurring except in FMER-OF areas. The extent to which timber volumes may be overestimated due to partial harvesting systems has been discussed, under *volume estimates of existing stands*.

For areas outside of FMER-OF and FMER-OR (87 percent of the timber harvesting land base), it was assumed that trees left for silviculture purposes such as seed trees and shelterwood trees will be harvested within a relatively short time of the initial harvest entry. The harvest of seed-trees and shelterwood trees has not been demonstrated to any significant degree in the past, but is anticipated to increase in the future. Current practices (blocks harvested after 1998-01-01) indicate that about 2.4 percent of harvesting outside of FMER-OF and FMER-OR areas have seed trees and about 3.2 percent have shelterwood trees left on site after harvesting. If these trees are not harvested and this practice continues in subsequent rotations, on average, the timber supply could be reduced by about 0.8 percent.

In my previous AAC determination, I stated the need to evaluate alternative analytical approaches to assessing the implications of uneven-aged (including partial harvesting) systems. The BCFS Research Branch has examined potential productivity changes at varying levels of retention. However, due to the complexity of interacting variables—including distribution of retained cover, incident light through the forest canopy, changing shadow patterns, changes in moisture regimes, and forest health conditions, and others—much work remains to be done before forest productivity under the various systems of partial harvesting can be reliably predicted.

It will be important to combine emerging productivity information with an assessment by district staff of the expected use of these systems, the extent of the areas affected, the amounts of expected retention and the frequency of harvesting entries, for incorporation in the next timber supply analysis for the Cranbrook TSA. I have noted the need for this information in the "Implementation" section. The extent to which the application of these

alternative systems introduces uncertainty to the timber supply has been discussed previously and further under "Reasons for decision."

Incremental silviculture

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning, fertilizing and planting improved seed that are beyond the basic silviculture activities required to establish a free-growing forest stand.

The *Forest Practices Code* requires the use of improved (class A) seed from seed orchards for regeneration where available. Class A seed is the product of B.C.'s tree improvement program, which uses standard domestication/breeding techniques to select naturally occurring well-performing trees. For the Cranbrook TSA, future volume gains from planting improved stock have been currently estimated at about 1 percent. This figure could increase in the future if more improved stock becomes available, with higher anticipated gains. Although volume gains were not reflected in the analysis, I encourage staff to continue to monitor trends such that any additional information can be used in future determinations.

In the Cranbrook TSA, incremental silviculture has been mainly limited to juvenile spacing, primarily on pure and leading lodgepole pine stands. In the analysis, regeneration assumptions reflect density control for regenerating stands. Current practice, based on existing funding levels and legislated obligations, indicates that only stands with over 6000 stems per hectare are planned for spacing. Therefore staff were concerned that many future densely-stocked stands may not be spaced to the levels indicated in the analysis.

From my discussions with district staff, I note their concern about the generally low level of spacing in the TSA. They submit that this may start to impact timber supplies as future stands will not achieve the minimum diameters currently assumed in the analysis for minimum harvestable ages, within the expected timeframes. However, I consider this to primarily represent a potential risk to the long-term timber supply and have taken this factor into account as discussed under *minimum harvestable ages*.

Commercial thinning

In the Cranbrook TSA 1999 timber supply analysis, no stands was assumed to be harvested by commercial thinning.

In my 1996 rationale, I requested that district staff identify any potential candidate stands for commercial thinning, given the declining timber supplies projected at that time. In 1997, a project by district and Nelson Forest Region staff indicated limited opportunities due to existing forest structure, species mix and low merchantable volumes in existing unmanaged stands. The study also noted apprehension regarding the biological potential of stands to maintain adequate growth after commercial thinning. In summary, the study reported little opportunity for commercial thinning soon. However, staff believe there may be some opportunities in the future as stands are spaced in preparation for a commercial thinning program. I appreciate the work by staff, and for this determination I consider the assumption in the 1999 analysis of no commercial thinning activity to be appropriate.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area:

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be removed from an area during harvesting operations. In the timber supply analysis, the current interior utilization standards were applied—a maximum 30-centimetre stump height, a minimum 10-centimetre top diameter inside bark, a minimum 12.5-centimetre diameter measured at breast height (dbh) for all lodgepole stands, and a minimum 17.5-centimetre diameter (dbh) for all other species.

EKES commented that the forest industry is beginning to implement reduced utilization standards due to the Forest Action Plan. Accordingly, they state that these reduced standards should be reflected where appropriate in the analysis. District staff advise that the interior utilization standards are consistently applied for the purpose of cut control and allowable annual cut administration. As such, if licensees choose not to utilize some material even though it contributes to the timber supply in this analysis, is it measured (scaled) for cut-control purposes and charged to their licence AAC, so that overcutting does not occur due to this approach.

District staff monitor utilization in accordance with BCFS policy and feel that licensees are generally in compliance with the Interior Timber Utilization Standards. If the utilization standards are revised and greater utilization consistently occurs, then I will reflect this in future determinations. For this determination, I accept that the utilization assumptions used in the timber supply analysis are reasonable.

Decay, waste and breakage

The estimation of volumes using VDYP for existing stands incorporates the loss of volume due to decay, waste and breakage. For decay, volume losses are incorporated directly into the volume estimates, while standard waste and breakage factors are applied to the analysis in the development of VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples. For regenerated stands, as discussed in *volume estimates for regenerating stands*, the TIPSY projections incorporate OAFs that account for anticipated decay, waste and breakage. In the timber supply analysis for the Cranbrook TSA, the standard decay, waste and breakage criteria were applied. I am satisfied that losses have been accounted for based on the provincial loss factors, and have made no adjustment to the assumptions applied in the analysis.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production:

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing

of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

- cutblock adjacency and green-up

To manage for resources such as water quality, soil stability, wildlife and aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum levels of disturbance in any given watershed (as reflected by the area covered by stands of less than a specified height), and require minimum green-up heights for regeneration on harvested areas before adjacent areas may be harvested.

For the analysis, the Cranbrook TSA was divided into overlapping management zones comprising total proportions of the timber harvesting land base as follows: about 29 percent is in the IRM zone; 37.4 percent in the visual and recreation management zone; 17.5 percent in the water management zone; about 33 percent in the wildlife zone; and about 22 percent in the fire-maintained ecosystem zone. As the zones overlap, they add to more than 100 percent. In addition, biodiversity requirements apply across the entire forest land base. Specific forest cover objectives assumed in the analysis for visual quality, water management, wildlife, fire-maintained ecosystems and biodiversity are discussed in corresponding sections later in this rationale.

In the IRM zone, operations are subject to guidelines for cutblock adjacency, cutblock size and the maximum area of recent harvesting-related disturbance. The FSSIM timber supply analysis model used for the Cranbrook analysis did not explicitly represent adjacency constraints. Rather, a forest cover requirement was applied in the model to approximate the effects of guidelines on cutblock adjacency and cutblock size. The requirement limited the area covered by stands below green-up height (2 metres) to a maximum of 33 percent within the timber harvesting land base with the exception of the IRM zone within the Montane Spruce - dry cool (MSdk) subzone, which had a maximum of 40 percent.

A green-up height of 2.0 metres was applied in the analysis to reflect the KBLUP guideline for green-up (as noted later, the higher level plan has not yet been designated). However, in the analysis a 2.0-metre inventory top height was used instead of a 2.5-metre inventory top height (corresponds to a 2.0 metre silviculture height), which more appropriately reflects the KBLUP intent. However, the pending KBLUP-HLP indicates that green-up height may be established as 2.5 metres for areas adequately stocked and 3.0 metres for areas not adequately stocked. Sensitivity analysis showed that if the green-up period was increased by 3 years, there would be no impact on the short- to mid-term timber supply, but in the long term would shift the time to decline closer by 1 decade.

Furthermore, how cutblock adjacency requirements will be implemented in the field is uncertain. I discussed in my previous AAC rationale the need for further examination of cutblock adjacency. District staff now believe that generally cutblock adjacency has become less of a concern as a result of implementing larger openings and reduced green-up height requirements to meet cutblock size objectives outlined in the *Biodiversity Guidebook*. Nonetheless, they expressed concern that FSSIM is not a spatial model. I

have recognized this as a provincial concern and have been advised that at a provincial level, FSSIM is the most efficient model available given the current size and detail of TSA databases.

Many sensitivity analyses were performed to assess the impact of the forest cover requirements used to approximate the effects of cutblock adjacency within the IRM zone. One sensitivity analysis showed that the maximum area with trees less than 2 metres tall could be reduced from the 33 percent in the base case to as low as 25 percent with little or no impact to timber supply. An additional sensitivity analysis, in which no cutblock adjacency or green-up heights were applied, showed similar results. All of the sensitivity analyses suggested that within the range tested, any uncertainty regarding the application of the forest cover guidelines used in the model to represent adjacency requirements does not greatly affect timber supply.

District staff have reviewed the assumptions regarding adjacency and green-up in the IRM zone not subject to the other constraints mentioned above, and found the assumptions to reasonably reflect current practice. For this determination, I consider the assumptions to be suitable and have made no adjustments.

- visually sensitive areas

Careful management of scenic areas visible from communities, public use areas and travel corridors is an important IRM objective. The Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve this, visual landscape inventories are carried out to identify, classify and record visually sensitive areas. On completion of such an inventory, a specialist may derive recommended visual quality classes (RVQCs, i.e.: 'Preservation'; 'Retention'; 'Partial retention'; 'Modification' or 'Maximum Modification') to identify levels of alteration that would be appropriate for particular areas. The Code requires these areas to be identified, by the district manager or in a higher level plan, and to be made known to licensees. When this has been done and an RVQC has become current practice, it may be incorporated into a timber supply analysis, preferably as a VQO established by the district manager or contained in a higher level plan. Established VQOs reflect the desired level of visual quality, based on the physical characteristics and social concern for an area, and seek to balance the perceptions and needs of people with the social and economic needs of the province. Managing for visual resources is important in the Cranbrook TSA due to the significance of tourism to the region.

To achieve the VQOs, constraints are placed on timber harvesting, road building and other forest practices. The constraints, which are based on experience, research findings and public preferences, are expressed in terms of "forest cover" requirements that relate to the maximum percentage of a "viewshed" that may be harvested at any one time, and to 'visually effective green-up' (VEG)—the stage at which a stand of reforested timber is perceived by the public to be satisfactorily "greened-up" from a visual standpoint.

In the Cranbrook TSA, visually sensitive areas are depicted by the Front Country Visual Management Guidelines from the KBLUP implementation strategy. District staff anticipate that designated scenic areas will be made known soon.

In the timber supply analysis, approximately 36 455 hectares, or 8.3 percent of the timber harvesting land base, were assumed to be managed for VQOs. Zones were created for the areas with retention, partial retention and modification VQOs. The constraints were then applied as the maximum percentage of productive forest area in each landscape unit that could be occupied by stands less than 6 metres in height. The restrictions for green-up were applied to the entire productive forestland base because disturbance restrictions in visual areas apply to the entire viewscape regardless of operability. Values for maximum percentage of disturbance that would reflect current practice were determined using provincial guidelines for factoring visual resources into timber supply analyses. Operationally these maximums are achievable as there is flexibility with good cutblock design and layout.

Overall, district staff believe that the assumptions applied in the analysis regarding visually sensitive areas were appropriate and reasonably reflective of current practice. I have reviewed the information and have made no further adjustments.

- recreation

Recreation is an important use of the forest resources in the Cranbrook TSA given the proximity to a number of provincial and national parks, and ski facilities in the region. Recreation use includes activities such as backcountry and heli skiing, downhill skiing, snowboarding, hiking, rock climbing, fishing and hunting. Recreation use in the Cranbrook TSA is extensive, largely unregulated, and has increased in recent years.

Based on current forest management practices that permit harvesting within recreationally sensitive areas, three recreation zones were defined with associated forest cover constraints. The zones covered about 280 593 hectares, with maximum disturbance allowances that ranged from 5 to 25 percent and green-up heights of between 3 and 6 metres.

Crestbrook submitted that KBLUP did not specify any additional constraints for recreation and it was intended that the 2-metre green-up heights would apply in these types of areas. Since the completion of the timber supply analysis, a sensitivity analysis has examined the risk to timber supply from the application of the constraints in the recreation zones, in particular in the moderate recreation zone which comprises about 259 189 hectares. The analysis found no change to the base case forecast if the constraint on the moderate recreation zone was removed.

I am mindful that although the recreation zone overlaps with other zones in the analysis, it may not be consistent with KBLUP and therefore the zone and constraints may not be necessary. However, as the constraints do not impact timber supply, I do not find it necessary to make adjustments to timber supply regarding this factor, as discussed under "Reasons for decision."

- cultural heritage resources

Cultural heritage resources are defined in the *Forest Act* and include archaeological sites, traditional use sites and objects such as culturally modified trees (CMTs). Archaeological sites and CMTs that predate 1846 are protected under the *Heritage Conservation Act*. The nature and extent of required protection of archaeological sites are detailed under this legislation.

Archaeological impact assessments (AIA) are completed for areas that have a moderate or high archaeological potential and are proposed for harvesting. Given the recommendations in the assessments, harvesting practices are modified. Generally, CMTs are not found in the Cranbrook TSA. A traditional use study has been undertaken, but specific data associated with the study have not been made available.

A submission from the Ktunaxa/Kinbasket Tribal Council submits that as chief forester I should consider the impact of a percentage of their traditional territory receiving additional management protection to prevent damage to archaeological sites, cultural sites and traditional use areas.

In the analysis, no specific reductions were applied as it was assumed that most archaeological sites do not preclude timber harvesting but require adjustments in harvesting methods. At this time the impacts of these adjustments on the size of the timber harvesting land base are unknown. Some sites have been located; however, they are generally small areas and are sometimes found beside waterways where harvesting is already limited.

In reviewing this information with district staff, I am assured that archaeological sites are protected during harvesting operations. I am mindful that even though there are some known archaeological sites within the TSA, these were not excluded from the timber harvesting land base due to the difficulty in assessing their exact location and potential impacts. If these areas could be mapped and analyzed, it is likely there could be a small reduction to the size of the timber harvesting land base.

Nevertheless, as the timber supply is relatively insensitive to changes in the size of the land base in the short term, as noted in *physical and economic operability*, I am satisfied that a reduction in the harvestable area in the TSA due to avoidance of areas of traditional use and archaeological significance can be accommodated in the short term without adjusting the projected timber supply. I have therefore made no specific accounting in this determination for any additional impacts from cultural heritage resources.

The Ktunaxa/Kinbasket Tribal Council also stated that they will gain authority and jurisdiction over some percentage of their asserted traditional territory which will reduce the timber harvesting land base. I am mindful that they have submitted a comprehensive land claim that covers the southeastern corner of British Columbia. As noted in "Guiding principles for AAC determinations" with respect to First Nation's issues, I am aware of the Crown's legal obligations resulting from recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations with respect to these decisions. Also, no BCFS timber supply analysis or associated AAC determination should be interpreted as prescribing any particular pattern

of harvesting activity in a TSA. Because the outcomes of treaty processes are subject to significant uncertainty before formal approval by governments, my position continues to be that in determining AACs it would be inappropriate to speculate on the timber supply impacts that will eventually result from decisions not yet made. Thus I do not account for possible impacts of existing or anticipated recommendations made by such processes, nor do I attempt to anticipate any action that governments could take in response to such recommendations.

From my considerations set out immediately above, and based on operational experience to date in the district, I am confident that during harvesting operations the district manager can accommodate cultural heritage resource values that may reasonably be expected at this time within the currently projected harvest levels.

- *community and domestic watersheds*

Guidelines for forest practices for hydrological recovery in community and domestic watersheds are found in *Interior Watershed Assessment Plan Guidebook*. In the timber supply analysis, the community watershed zone covers 5.5 percent of the timber harvesting land base. To reflect practices in these watersheds, no more than 25 percent of the forested area in the zone could be covered by forest stands less than 9 metres tall at any time. For management of domestic watersheds, which cover 11.9 percent of the timber harvesting land base, a maximum of 30 percent of the forested area could be covered by forest stands less than 9 metres tall at any time.

One submission questioned the application of a 9-metre green-up height. Staff have advised me that there are various approaches for reflecting hydrological recovery in timber supply analyses. In the Cranbrook TSA, a 9-metre green-up height was applied to the maximum area allowed within the total forested area within a landscape unit.

EKES stated that constraints applied to community and domestic watersheds should also be applied to regionally significant fisheries watersheds, such as the Wigwam and St. Mary's rivers. Also, the allowable percent disturbance should be reduced to a maximum of 20 percent for community watersheds and 25 percent for domestic watersheds. In addition, they state that green-up heights should be increased to reflect recent research. However, research staff indicate that no generalized green-up heights can be interpreted from current research to suggest that the approach in the Cranbrook analysis needs to be adjusted.

A sensitivity analysis that examined timber supply implications from changing the maximum disturbance in the integrated resource management zone, caribou zone and fire-maintained zone from 33 to 25 percent showed a shift in the transition period during the mid-term, but showed no change to the short-term or long-term timber supply.

Little harvesting activity has occurred in some of these watersheds in the past few years. When harvesting does occur, the actual practices and harvesting rate may vary from the assumptions in the analysis. However, I am mindful that the modelling constraints have been applied to reflect a 9-metre green-up provision in the community and domestic watershed zones. Although this approach may vary from other analyses, it does not pose a risk to timber supply. I note that constraints regarding community and domestic

watersheds have been approximated and for this determination I do not consider any adjustments necessary.

- riparian areas

Riparian areas occur along streams, around lakes and in wetlands. The *Riparian Management Area Guidebook* requires the establishment of riparian reserve zones that exclude timber harvesting in some cases, and riparian management zones that restrict timber harvesting in order to protect riparian and aquatic habitats. To estimate the area needed in riparian reserves and riparian management zones, BCFS and MELP staff examined the Watershed Atlas for stream networks, lakes and wetlands, community watershed polygons and fish inventory data. Application of the guidelines to reflect the protection of riparian areas resulted in a 34 147 hectare deduction to the productive forest land base, which is about 7.8 percent of the current timber harvesting land base. District staff confirmed that the assumptions used in the analysis are generally reflective of actual practices within the TSA.

Several concerns were raised about the width of the reserves and management zones. Crestbrook questioned the total hectares deducted for riparian areas, suggesting it was double the estimate reported in the *Code Timber Supply Analysis - 1996* study. I consider the Code impact study to have estimated impacts at a provincial timber supply level. At a district level the impacts may be more or less than the provincial estimate.

Staff rigorously reviewed existing maps for identification of riparian areas to approximate practices in these areas. For future determinations I anticipate that even more information will be available to improve the estimate of riparian areas and associated management regimes. For this determination, I accept that the land base reductions adequately represent the known constraints in the TSA arising from the management of riparian areas.

- wildlife habitat

For the many species of wildlife in the Cranbrook TSA there are various requirements for habitat management, as summarized in the following sections.

1) caribou habitat

Caribou in the Cranbrook TSA have been identified as a threatened species and a key management issue in KBLUP. The KBLUP guides current practice within priority 1 and 2 caribou areas and requires harvesting to be distributed and limited by biogeoclimatic zones. In the analysis, priority 1 and 2 caribou habitat areas were identified as a zone within the operable land base on slopes less than 80 percent. This resulted in the delineation of 36 076 hectares of timber harvesting land base. In the analysis, forest cover requirements that reflect the KBLUP were then applied in these zones.

More recent radio-telemetry research has shown that some areas identified as priority 1 or 2 are no longer considered critical, while some other areas used by caribou were not included. Overall, staff are satisfied that the assumptions in the analysis reasonably approximate the management of habitat requirements for caribou. I acknowledge that the exact area for priority caribou habitat may change over time. However, I am satisfied both that current management reflects a due respect for the needs of caribou, and that the

implications for timber supply of this management are adequately reflected in the current timber supply projection.

2) ungulate winter range

The ungulate winter range zones, which cover 107 325 hectares of timber harvesting land base, were based on biophysical mapping for wildlife completed in the 1970s. The forest cover requirements applied to each zone reflect the intent for ungulate winter range found in the KBLUP. In addition, it was assumed that the guidelines for the FMER-OR and FMER-OF, which provide the balance of forage and cover, take precedence over ungulate winter range guidelines.

Staff advised me that although forest cover constraints were applied to maintain a minimum amount of area in older age classes, constraints were not applied to reflect a maximum area allowed below a specific green-up height (as applied in the IRM zone). However, as discussed under cutblock adjacency and green-up, I find that increasing or decreasing forest cover requirements does not pose a risk to timber supply as reported in the base case. Nonetheless, in practice both younger (green-up) and older age forest cover constraints are applied.

I understand that work is underway to improve the ungulate winter range guidelines by introducing a habitat-based regime rather than the current species-based approach. I find that the current guidelines for ungulate winter range were reasonably reflected in the analysis, except for green-up. However, I do not consider this finding to introduce a risk to timber supply in this determination.

3) identified wildlife

Under the Forest Practices Code of British Columbia Act, identified wildlife are those wildlife species and plant communities that have been approved by the chief forester and deputy minister of Environment, Lands and Parks as requiring special management. As announced February 1999, the province's Identified Wildlife Management Strategy (IWMS)—for endangered, threatened, vulnerable and regionally significant—identifies species which do not already have existing management strategies.

Identified wildlife will be managed through the establishment of wildlife habitat areas (WHAs) and the implementation of general measures for wildlife, or through other management practices specified in higher level plans. In the Cranbrook analysis, no accounting was made for managing identified wildlife in this way because wildlife habitat areas had not been established when the data package was created. Some inventory work has now been carried out. One WHA is being proposed for bull trout and one for Lewis' woodpecker, but no broadly applied current management practices for identified wildlife have yet been implemented in the TSA.

At this stage it is too early to speculate on the total habitat area that will be required to implement the IWMS, and on how much of this area will lie within the current timber harvesting land base. The total eventual implications of these measures for timber supply cannot currently be known, and inventories are required to reduce the uncertainties. However, government has committed to appropriate management of identified wildlife

species on the understanding that this can be attained within a provincial timber supply impact of 1 percent.

MELP raised concerns that other than measures previously discussed, there were no other constraints applied for wildlife in the analysis. In particular they expressed concern that regional connectivity corridors were not considered as currently proposed in the KBLUP-HLP. In addition, they noted that whitebark pine, an important food source for many wildlife species, is becoming increasingly scarce (1059 hectares out of a total of approximately 14,000 hectares are within the timber harvesting land base) due to white pine blister rust and harvesting. Therefore, they recommend that the species be removed from contributing to the timber supply. As well, the Ktunaxa/Kinbasket Tribal Council stated that whitebark pine is an important traditional species and should not be harvested.

In summary for caribou and ungulate winter range areas, I find that the assumptions in the analysis reasonably reflect the constraints on these areas. However, I also acknowledge that the management of these areas will become more clear over time, as the HLP is finalized and implemented, or as the results of new research information is integrated into management strategies.

As for whitebark pine, I understand that KBLUP did not examine the management of whitebark pine. Given the increasing scarcity of this tree species, the district should consider managing this species within their ongoing work in designating old-growth management areas and retention of mature forest areas. I expect that this information will be available for the next AAC determination. Finally, since the analysis did not account for the management of identified wildlife, I have accounted for up to a 1-percent overestimation in the timber harvesting land base, as discussed in "Reasons for decision."

- fire-maintained ecosystem restoration

In the Cranbrook TSA, the dry lower elevation open forests and grasslands have a history of frequent fires. However, with 70 years of successful fire suppression activity by the BCFS, the absence of fire has changed the ecology of these drier low elevation sites. In some cases, the changes include decreased catastrophic fire losses, but also decreased forest health, lowered timber quality, increased risk of fire and loss of important habitat for wildlife and domestic cattle.

These sites cover a large area in the Nelson Forest Region, known as the Rocky Mountain Trench (the trench). The Code has classified fire-maintained ecosystems as natural disturbance type 4 (NDT 4). In the NDT 4 trench area, native grasslands and open forests are being converted to a closed-canopy forest due to ingrowth and forest encroachment. The 1997 KBLUP implementation strategy outlined objectives for managed forest, open forest and open range in the trench, which includes 227 657 hectares in the TSA, or about 95 495 hectares of timber harvesting land base.

The March 1998 *Cranbrook Forest District Fire Maintained Ecosystem Adjustment Strategy* delineated areas for the restoration of fire-maintained ecosystems, which are described as either managed forest, open forest (OF) or open range (OR), as per the Fire Maintained Ecosystem Restoration (FMER) objectives of the KBLUP. Further to the Ecosystem Adjustment Strategy, a report titled *A Blueprint for Action* was published in

February 2000 by the Rocky Mountain Trench Ecosystem Restoration Steering Committee. The blueprint outlines a program for restoring the trench to the desired mosaic of managed forest, open forest and open range on Crown land over the next 30 years. More recently the strategy has included shrubland; however, I note that these areas do not contribute to the timber supply.

In the analysis the 95 495 hectares were assumed to be managed as follows: 36 441 hectares as managed forest, 39 362 hectares as open forest and 19 692 hectares as forest conversion to open range. For the managed forest areas, the constraints applied were the same as those applied to those ecosystem types in the integrated resource management zone. For the open forest areas, the existing and regenerated stand volumes were reduced by 32.7 percent and other constraints were applied as discussed in *volume estimates for regenerating stands*. For the open range areas, an 18.3 percent reduction was applied to existing stand yields. The FMER-OR areas were assumed to be removed from the timber harvesting land base following their initial harvest and rehabilitation. For both the OF and OR areas, the volume reductions were made to account for the residual volume left to meet objectives for stand level biodiversity, fire-maintained ecosystems, and ungulate winter range.

In addition to the FMER stands included in the timber harvesting land base in the base case, staff estimate an additional 6572 hectares of low volume stands (currently excluded) are expected to be converted to open range, and 291 hectares of low volume stands are expected to be converted to open forest. As a result, a total of 6863 hectares requires treatment for ecosystem restoration that will yield a minor harvest of some merchantable sawlogs. As the restoration program is expected to be managed over a 30-year period, harvesting of these types could occur at a rate of about 230 hectares per year.

Similar to the *problem forest type* factor, staff advise me that due to the very low merchantability of these existing stands, it is difficult to determine an accurate estimate of the volume that meets current utilization and grade standards. Rough estimates of the merchantable volume on these areas indicates an average volume of 13 cubic metres per hectare can be attained, although there is much variability expected between areas. Based on this, restoration of about 230 hectares per year would result in a harvest level of about 3000 cubic metres per year over a 30-year period.

It is important to differentiate between the 95 495 hectares of FMER areas included in the timber harvesting land base assumed in the base case, and the 6863 hectares of additional FMER area referenced in the paragraphs above. The areas in the base case represent average productivity for the TSA, and have sufficient volumes per hectare and stand characteristics that render them economically suitable for development. The objectives for these areas can be met during the course of normal harvesting operations in the TSA, and I am satisfied that the base case assumptions in this regard were appropriate.

However, the additional 6863 hectares under consideration represent marginal areas that do not have sufficient volume or stand characteristics to be viable for development in the course of normal timber harvesting operations. Nevertheless, it is desirable to treat these areas, and they will produce some volume that can likely be utilized.

I received several submissions stating that the current AAC limits the achievement of the restoration program goals. Some suggested that limitations could be removed if all of the NDT 4 areas were excluded from contributing to the timber harvesting land base and hence the AAC, thereby removing AAC constraints from affecting how this area is managed. However, my AAC determination must reflect all the merchantable harvesting activity that occurs on Crown land within TSAs and TFLs, and establish an annual harvest level. Another suggestion included the establishment of a partition within the existing harvest level. Also, I understand there are other limitations facing the restoration program such as staffing levels and financial constraints.

As mentioned under *problem forest types*, a small area (less than 1000 hectares) of leading Douglas-fir stands has limited merchantability due to armillaria root disease. District staff anticipate that these areas will be suitable candidates for conversion to grass land or to open forest to meet restoration goals as well.

I am mindful of government's commitment to achieving the KBLUP goals for managing forest encroachment in fire-maintained ecosystems over a period of 30 years. BCFS and MELP staff have advised me that although managing some of these sites does not entirely depend on harvesting merchantable timber, increased levels of harvesting should occur in order to manage forest encroachment into these important grassland ecosystems. I am aware that harvesting and restoration is currently underway in the NDT 4 trench area. However, there are an additional 6863 hectares of stands with varying levels of merchantability for which harvesting and restoration would be desirable. I consider this additional area to represent an additional 3000 cubic metres per year relative to the timber supply projected in the base case. To ensure that any increase to harvest levels is confined to volume harvested from these types, I have specified a partition for this additional timber supply, to be managed on the basis of an annual area harvested. I have discussed my reasoning and accounting for this factor under "Reasons for decision."

- stand-level biodiversity

Biological diversity, or biodiversity, is defined as the full range of living organisms, in all their forms and levels of organization. Biodiversity includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

Stand-level biodiversity management includes retaining wildlife trees and patches (WTPs), within or adjacent to cutblocks to provide structural diversity and wildlife habitat. Since the timber supply analysis for the Cranbrook TSA was initiated prior to release of the *Landscape Unit Planning Guide*, retention rates for WTPs were based on Table 20a of the *Biodiversity Guidebook*. These requirements are considered current management and are included in the analysis.

In my previous rationale for the Cranbrook TSA, I requested a review of how residual volume left on site after harvesting could achieve specific objectives. For the 1999 timber supply analysis, district staff estimated from a sample of site prescriptions, that wildlife trees and wildlife tree patches reduce timber volumes by 3.9 percent in areas not managed for FMER (87 percent of the timber harvesting land base). The use of partial harvesting

and seed-tree systems also results in the retention of additional residual trees (discussed under *silvicultural systems*), but these additional residual trees were not included in volume reductions for stand-level biodiversity, as they were ultimately assumed to be harvested shortly following the initial harvest (i.e. once silvicultural objectives are achieved). As previously discussed, in areas managed for FMER open forest and open range, timber volumes were reduced by 32.7 percent and 18.3 percent, respectively, to account for biodiversity and KBLUP requirements.

EKES submitted that the 3.9 percent reduction for stand-level biodiversity does not adequately reflect current management. I was advised that in their initial assessments, the district staff found from their sample of site prescriptions, that after removing areas already accounted as riparian reserves, environmentally sensitive and inoperable, that about 7.9 percent of the total volume was retained within cutblocks for wildlife trees and wildlife tree patches. This retention estimate was then reviewed in light of future adjacent cutblocks, where it was felt that current wildlife trees and wildlife tree patches could contribute to meeting future stand-level biodiversity objectives in adjacent areas. The estimate of 7.9 percent was therefore adjusted to an average of 3.9 percent volume retention to more accurately reflect stand-level biodiversity objectives over the total timber harvesting land base.

An industry submission stated the reduction was double the impact suggested by the Code analysis report, and that WTPs will not be required in the future where inoperable areas, or areas constrained to meet seral stage requirements can achieve objectives for stand-level biodiversity. Although the reductions may be higher than the provincial estimates, I do not find them extraordinarily high. Nonetheless, I understand that staff are currently working with licensees to ensure that objectives for stand-level biodiversity are met. If volume reduction factors are subsequently adjusted, I will consider them in future determinations.

I have considered the information regarding stand-level biodiversity, and believe that the assumptions applied in the analysis were consistent with provincial policy, which is intended to ensure adequate accounting for stand-level biodiversity. As mentioned elsewhere in this rationale, I am also accounting for the use of partial harvesting silvicultural systems, which also partly accounts for the increased retention indicated by the operational plans. Therefore, I accept for this determination that stand-level biodiversity has been adequately accounted for in the analysis, and will make no further adjustments in this regard.

I recommend that district staff continue to assess requirements for stand-level biodiversity in the TSA, such that biodiversity objectives can be clearly defined within the scope of the current policy framework.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that maintaining these conditions—together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions—will provide for the habitat needs of most forest and range organisms.

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests. In accounting for landscape-level biodiversity in the analysis, the following modelling assumptions were made:

1) biodiversity emphasis options

The delineation and formal designation of "landscape units" is a key component of a sub-regional biodiversity management strategy. A landscape unit is an area established by the district manager, generally up to 100 000 hectares in size, based on topographic or geographic features such as a watershed, or series of watersheds, to manage biodiversity and other forest resource values.

The *Biodiversity Guidebook*, the *Landscape Unit Planning Guide* and *Higher Level Plans: Policy and Procedures* (Policies and Procedures) all provide policy and guidance on management for landscape-level biodiversity. The *Landscape Unit Planning Guide* contains forest cover requirements for old seral forest that are to be applied at the biogeoclimatic variant level within each landscape unit. The *Higher Level Plans: Policy and Procedures* provides further policy guidance. The *Policy and Procedures* outline three biodiversity emphasis options (BEOs) - lower, intermediate and higher - that may be employed when establishing biodiversity management objectives for a landscape unit.

To achieve a balance between biodiversity and timber supply objectives, the *Policy and Procedures* recommend application of a mix of BEOs in each sub-regional planning area. The proportions of a planning area subject to lower and intermediate biodiversity emphasis should range from 30 to 55 percent, with the average at approximately 45 percent of the area subject to lower, 45 percent to intermediate, and 10 percent to a higher BEO.

In the absence of legally established BEOs, to balance social and economic impacts against risk to biodiversity, the provincial policy generally followed for timber supply analyses—and in the analysis for the Cranbrook for all areas except the FMER zone—is to model the distribution of BEOs using a weighted average forest cover requirement: 45 percent in the lower, 45 percent in the intermediate, and 10 percent in the higher BEO for each landscape unit / biogeoclimatic subzone combination. In the base case, the weighted averages were applied to both the mature plus old, and the old-seral stage requirements.

Recently, a Regional Landscape Unit Planning Strategy (RLUPS) resulted in decisions about BEO assignments (45.6 in lower, 44.5 in intermediate, 9.9 percent in higher BEOs, applied by biogeoclimatic variant) that were subsequently included in instructions to licensees preparing forest development plans. The pending KBLUP-HLP is expected to confirm these assignments.

Public comments, including those from the forest industry, suggested that the analysis examine the timber supply impact from applying the BEO assignments from the KBLUP implementation strategy. An additional sensitivity analysis was completed by staff which examined this potential impact to timber supply by applying the RLUP assignments. It showed that the base case initial harvest level could be maintained for 5 decades

(as compared to 13 decades in the base case) and could increase to the same long term harvest level, although 5 decades sooner than in the base case.

Before the next determination, I anticipate the BEO assignments will be legally established and reflected in the timber supply analysis. Until then, I consider the approach taken in the analysis to be reasonable in terms of accounting for BEO distribution, and constraints on timber supply pending finalization of landscape unit planning.

2) proportional old seral requirements in operable and inoperable areas

Consistent with recent direction, in the base case the forest cover requirements for old seral requirements were assumed to be met first, and where possible, from inoperable forests and then from operable forests. Prior to this direction, the KBLUP implementation strategy had taken more of a proportional approach. For example, if 50 percent of a biogeoclimatic unit was in the operable areas, then about 50 percent of the guideline would need to be met from operable forests. For this determination, I accept the assumptions applied in the base case as providing a reasonable accounting for this factor in a manner consistent with the general policy approach applied provincially.

3) aging of forest stands in areas outside the timber harvesting land base

While the forest inventory supporting timber supply analyses is updated regularly to reflect recent disturbances such as those from fire, insects or disease, ongoing natural disturbances were not explicitly modelled in the analysis. EKES submitted it is unreasonable to assume in the analysis that forests outside the timber harvesting land base (non-contributing forests) will continue to age over time so that, eventually, all non-contributing stands are over 250 years old. As a result, over time an unrealistic proportion of the old seral requirements for landscape-level biodiversity is projected to be met by non-contributing forests.

An alternative approach would be to assume that the existing age-class distribution in non-contributing stands remains the same over time (i.e., that disturbances will offset the aging of the forests). However, this "static" approach would probably overestimate the number of natural disturbances, assuming that fire suppression will enable a higher proportion of non-contributing forested areas to age undisturbed over time than in the past. This in turn would likely lead to an underestimation in the future contribution to old seral requirements made by currently young stands, as these age.

In the absence of supporting research, it might have been more realistic in the analysis to apply a disturbance factor based on professional judgement. As discussed under "Reasons for decision," this issue needs to be explored provincially to determine a more appropriate aging cycle based on ecological principles. However, since the short-term timber supply is relatively insensitive to uncertainty in these assumptions, the time can be taken to further review and refine the approach for future timber supply analyses.

4) connectivity corridors

The pending HLP lists general provisions for connectivity corridors for regional ecosystem connectivity. The timber supply analysis did not account for connectivity corridors. Until more information is gathered about potential impacts to timber supply regarding this

factor, I cannot speculate on what impacts the corridors may have on the timber supply for the Cranbrook TSA.

In summary, I note that the timber supply forecast is sensitive in the mid term (after 50 years) to changes to the assumptions regarding landscape-level biodiversity, when the BEO assignments provided by the RLUPS—expected to be confirmed in the Kootenay-Boundary Higher Level Plan Order - Draft—are applied. I have considered this potential risk to timber supply as discussed under "Reasons for decision" and I urge district staff to continue to address any uncertainty in this factor during ongoing operational planning in the TSA.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber;

Kootenay-Boundary Land Use Plan

Government announced the Kootenay-Boundary Land Use Plan (KBLUP) in March 1995, and the detailed implementation strategy in 1997.

More recently on June 29, 2000, government released the Kootenay-Boundary Higher Level Plan Order - Draft. The announcement detailed government's intent to establish a higher level plan (HLP) under the Forest Practices Code (FPC) to declare forestry-related components of the Kootenay-Boundary Land Use Plan as legal requirements. A 60-day public review period ended on September 26, 2000. The HLP will be revised as appropriate before final approval by the ministers of Environment, Lands and Parks, of Forests, and of Energy and Mines, who will first consider public comments on the draft HLP order.

The following elements of the KBLUP are being proposed as part of the draft HLP:

- In addition to old forest retention targets, there will be mature forest retention targets.
- Biodiversity emphases will be assigned to each landscape unit
- Caribou habitat requirements for specific areas will be brought into force.
- Regional connectivity and location of important avalanche tracks will influence the location of mature and old forest retention in certain instances.
- Green-up will be reduced while patch size may be increased.
- Enhanced Resource Development Zones for timber will be confirmed.
- Fire-maintained ecosystems will be restored.
- Streams within domestic watersheds will have increased protection.
- Scenic areas will be established.

When the HLP has been established, district managers must ensure that any plans which they approve under the FPC are consistent with any legally established HLP objectives. At present however, they do not have the legal authority to require licensees to implement the HLP unless they determine it is necessary to adequately manage and conserve specific forest resources. Once the HLP has been designated and implemented, I anticipate that more refined information regarding timber supply impacts will be available for future

timber supply reviews. I have tried to stay mindful of the likely implications to timber supply of finalizing the KBLUP, and have reviewed and referred to numerous sensitivity analyses, in this regard, throughout the document.

Additional land alienations

Due to future developments for ski hill resorts, a proposed nature park, and coal mining in the Cranbrook TSA, district staff advise that additional areas may be removed from the timber harvesting land base. The future expansion of ski hill resorts is largely unquantified and speculative at present. Until the areas have been rezoned, I do not consider this potential development as a risk to timber supply for this determination.

The proposed Kimberley Nature Park covers about 850 hectares of timber harvesting land base within the Kimberley municipal boundary for which the City of Kimberley is applying for a licence of occupation. One submission raised the concern about the area's inclusion as part of the timber harvesting land base for this determination. However, I note that regardless of whether the area contributes to the current timber harvesting land base, my AAC determination does not preclude future options for how this area is to be managed.

It is expected that most coal mining areas within the timber harvesting land base will be rehabilitated back to some level of forest productivity, although some areas may be converted to lower productivity levels or open range. Therefore, coal-mining development could reduce the size of the timber harvesting land base and affect its long-term forest productivity. However, until the areas are developed and productivity implications are known, the impact to timber supply is difficult to estimate.

The future expansion of ski hill resorts and mining development will be captured when they can be quantified in future timber supply analyses. Until a government decision designates the nature park, it continues to be part of the TSA and hence contribute to the timber harvesting land base. If and when the nature park is designated, it will be accounted for in a future determination.

Harvest sequencing

In the base case forecast, the highest priority for harvesting was given to stands that were oldest relative to their minimum harvestable age, subject to meeting the mature and old seral retention requirements. This generally resulted in reflecting the harvesting of the older mid-seral and mature stands, but not necessarily all of the oldest stands as forest cover requirements and seral-stage targets for biodiversity must also be met in the analysis. Lodgepole pine stands cover almost 50 percent of the timber harvesting land base, and therefore the analysis assumed the same relative-oldest first criteria, which in some cases resulted in pine stands aging beyond maturity. Lodgepole pine is a pioneer tree species; if not harvested at or near maturity, it becomes increasingly susceptible to mountain pine beetle infestations, wildfires, or pathogenic decline, and therefore becomes an increasing forest health risk.

Forest development plans show that the age of stands planned for harvesting varies, particularly given the district's direction for harvest of infested lodgepole pine stands.

District staff submit that modelling a random selection of harvestable ages, somewhere between the minimum harvestable ages and stand ages retained for biodiversity, would more accurately reflect current practice.

A sensitivity analysis shows the impact on timber supply of a random-age harvest sequence. In this case, the initial harvest level could only be maintained for 4 decades and not 13 decades as projected in the base case, with a 6-percent lower long-term harvest level.

In practice, I expect that the actual ages of harvested stands are not truly random because stands are generally selected on the basis of factors affecting availability with a view to selecting the older, higher volume stands first wherever possible. However, I also recognize that stands harvested are not entirely the relatively oldest stands but somewhere in between the random and relative oldest-first assumptions as tested in the analysis. Therefore, I acknowledge that under current operational conditions the modelling assumption of "relative oldest first" in the base case does not exactly reflect the current sequence of harvested ages. Additionally the sensitivity analysis shows that the assumptions of "random-first" sequencing does not pose a significant risk to the initial base case forecast. However, the timber supply implications may increase when analyzed with changes in other factors. I have considered this risk to timber supply as noted in "Reasons for decision."

To reduce the identified potential for timber supply reductions in the mid- to long term, I recommend that harvesting operations strive to balance harvesting priorities for both the aging lodgepole pine stands and the other older species first wherever possible, and to continue to improve access to the older stands throughout the TSA. I expect a thorough re-evaluation of this factor for future timber supply analysis.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

Alternative rates of harvest

The nature of the transition from harvesting old-growth to second-growth forests is a major consideration in determining AACs in many parts of the province. In the short term, the large timber volumes in older forests often permit harvesting above long-term levels without jeopardizing future timber supplies. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain stable enough so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts beyond that required to maintain forest productivity and future harvest stability.

In the analysis for the Cranbrook TSA, several alternative rates of harvest were evaluated in selecting the base case harvest forecast. One forecast prepared, which tested an even-

flow harvest forecast, illustrated that an annual harvest level of 831 000 cubic metres could be maintained for the entire analysis horizon. In another harvest flow projection, the highest level that could be obtained without lowering the long-term harvest level showed that an initial harvest level of 1 058 000 cubic metres could be maintained for 1 decade before declining for 4 decades to an annual mid-term level of 754 000 cubic metres. Although the analysis indicates it is possible to increase short-term harvest levels above the current AAC, I will not choose to increase the AAC if it is likely that harvest levels must decrease again in the future, unless there is a sound and compelling management reason to do so. I have reviewed this principle again as noted below under "Reasons for decision."

I am satisfied that the selected base case harvest forecast allows some scheduling flexibility in the short and medium terms, and I believe it to be an appropriate basis from which to evaluate timber supply in the TSA.

Community dependence on the forest industry

The socio-economic analysis for the Cranbrook TSA details the impact of timber supply adjustments on local communities and the provincial economy. The three most significant contributors to the economy of the Cranbrook TSA are the public sector (including government-employed forestry workers), primary industries (mainly mining) and forestry. In 1996, the forestry sector supported approximately 16 percent of the total labour force in the TSA.

The analysis reports that the current AAC of 850 000 cubic metres can support 677 person-years of direct employment and 363 person-years of indirect/induced employment within the TSA. Provincially, including local employment, the current AAC can support 806 person-years of direct employment and 761 person-years of indirect and induced employment. Annual provincial revenues associated with this AAC, including provincial income tax, royalties, stumpage and rent, total about $26.5 million.

Public input from Ktunaxa Kinbasket Tribal Council stated that tourism will soon contribute as much to the local economy in terms of direct income and economic multipliers as the forest industry. While I acknowledge that the tourism sector currently provides 14 percent of the total employment and is likely to increase, I note that this does not reduce the contribution to employment and community stability provided by the forestry sector.

I note that the Timber Supply Review strives to adequately reflect the protection measures for all resource values, including visual quality, wildlife habitat, recreation and other values on which tourism is partly dependent. I am satisfied that an appropriate accounting for these resource values has been made in this determination, either in the timber supply analysis assumptions, or as a result of the adjustments I am making to the base case forecast. I have reviewed the socio-economic analysis, which used an established and sound methodology to evaluate the community dependencies for the Cranbrook TSA. I am mindful that communities within and outside of the Cranbrook TSA depend on the timber supply from the TSA, and that any adjustment to the harvest level will impact these communities.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;

Timber processing facilities

- existing mills

Within the TSA, there are three major mills: Crestbrook Forest Industries' sawmill at Elko; Galloway Lumber Company's sawmill at Galloway; and McDonald Ranch and Lumber's sawmill at Grasmere. The many smaller sawmills include Bear Lumber, Canalog Wood Industries Ltd. (log homes), Carney Forest Products Limited (poles), K.R.B. Log Structures (log homes), and J.R. Blackmore and Sons Ltd. (posts). In addition, there are many other smaller mills in the Cranbrook TSA that process small volumes of sawlogs and/or other special forest products. Timber harvested from the Cranbrook TSA is processed both inside and outside of the TSA.

The annual timber processing capacity of the existing processing facilities in the TSA is estimated at 1.0–1.2 million cubic metres. As the current harvest level for the Cranbrook TSA is 850 000 cubic metres, additional timber supplies come from nearby TSAs and private sources both within and outside of the TSA. As well, processing facilities outside the TSA depend on the Cranbrook TSA timber supply. Crestbrook Forest Industries' pulp mill at Skookumchuck depends on wood chips produced at the Elko Sawmill (within the Cranbrook TSA) and Canal Flats Sawmill (within the Invermere TSA). Several timber processors within the TSA have stated that processing capacity exceeds the available wood supply.

Postwood (timber between 7.5 centimetres dbh and 12.5 centimetres dbh) is often a by-product of conventional sawlog operations or is found in densely-stocked lodgepole pine stands. Interest has been expressed to utilize more postwood, which I have discussed previously, under *problem forest types*.

District staff estimate that current mill demand for Douglas-fir and larch is limited to about 150 000 cubic metres per year, or about 18 percent of the current annual harvest level. The analysis shows that existing Douglas-fir and larch stands comprise approximately 30 percent of the timber harvesting land base, and for the first 4 decades in the base case forecast, the annual contribution from these stands is about 130 000 cubic metres, which then more than doubles for the subsequent decade. After the fifth decade, this harvest contribution gradually declines as these stands are harvested and regenerated. As I am mindful that mill demand for specific types of wood often changes and adapts to available wood supply, I have not adjusted assumptions regarding the contribution of Douglas-fir and larch in the base case for this determination.

- proposed facilities

A value-added plant is now operating at the previous Cranbrook Sawmill site. Tembec, who purchased Crestbrook Forest Industries, has committed to the operation of the value-added finger-jointing plant, which will employ up to 40 people. The plant will process trim-ends and cuttings from the Canal Flats and Elko sawmills and produce

finger-jointed dimension lumber. Tembec, given its experience in eastern Canada with cogeneration plants, has now purchased equipment to construct a cogeneration plant at the Skookumchuck Pulp Mill. It is anticipated that residue fibre from the existing timber processing plants in the region will supply most of the new facility's requirements.

After reviewing the information about existing and proposed milling facilities, I conclude that there is a high level of demand for the Cranbrook timber supply – both from within the Cranbrook TSA and from outside the TSA.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

Economic and social objectives

- Minister's letter and memorandum

The Minister of Forests has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester: a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996 (attached as Appendix 4). The letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He emphasized the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for the Cranbrook TSA. As discussed under *commercial thinning*, I have concluded there are limited opportunities for commercial thinning at this time. However, opportunities may increase and I will consider this in future determinations. As discussed under *problem forest types* and *fire-maintained ecosystem restoration*, I believe additional areas to those assumed in the analysis are operable and available for harvesting and therefore an increase to the harvest level is warranted at this time.

- local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the Timber Supply Review where these are consistent with government's broader objectives. Many public responses were received regarding the information report and data package, and the timber supply and socio-economic analyses. The summary of public input is reproduced as attached in Appendix 5.

The approval of the Kootenay-Boundary Land Use Plan (KBLUP) reflects the government's commitment to achieve the Crown's social and economic objectives for the region, including the Cranbrook TSA. Furthermore, ongoing activities associated with creating a higher level plan (HLP), which flows from the KBLUP, is further evidence of government's objectives for this area. Overall, the HLP is expected to give greater certainty for both environmental values and the forest industry.

Three submissions express the opinion that the analysis does not sufficiently consider changes in the social and economic drivers in the Cranbrook TSA. These changes include the transition from single resource-dependence to greater diversification (e.g., tourism investments) and increasing public concerns about viewscapes, recreational opportunities, and environmental values (water quality, biodiversity, wildlife habitat, etc.).

EKES says changes in social values should be reflected in the Timber Supply Review as licensees are increasingly encountering resistance to management proposals on sites prioritized by communities for non-timber values. Two other submissions are of the opinion that the forest industry remains a cornerstone of the local economy, and must be maintained in a healthy and productive state.

The Kimberley Community Forest Working Group says the resolution of land claims may have major implications on timber supply and should be examined in a sensitivity analysis. The group also says full-cost accounting should be used in the assessment of government revenues.

Several submissions express the opinion that the current AAC should be maintained, based on the analysis information and the importance of the forest industry. The Kimberley Community Forest Working Group says the base case must be approached with great caution. Also, the willingness to consider local wishes (e.g., opposition to watershed logging) by reducing the AAC will enable solutions to current tensions between competing land uses. EKES believes that until a long-term harvest projection based on a spatial model is available, harvest levels must be conservative enough to retain options for meeting other objectives.

As discussed elsewhere in this document, the analysis accounts for management under the Forest Practices Code and includes many aspects of the KBLUP. Where necessary, I have accounted for adjustments in my determination in order to more accurately reflect the implications of current management in this TSA. In my considerations throughout this document I have attempted to account for the need to balance socio-economic and environmental benefits and risks both now and over time.

I am mindful of the public input received and, where possible in this rationale, I have attempted to respond briefly to specific concerns. Consideration of public input has been an important component of my determination for the Cranbrook TSA. I note that some of the public input received refers to items beyond my mandate for consideration under the *Forest Act*, which relates specifically to the determination of AACs for TSAs and TFLs.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Abnormal infestations and salvage

Forest stands are susceptible to damaging agents such as wildfires, windthrow, and disease and insects. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are generally measured and accounted for during forest inventory sampling for existing stand volumes or through other sampling methods. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *volume estimates for regenerating stands*. In the timber supply analysis it is necessary to estimate and account for the unsalvaged losses resulting from epidemic (abnormal) infestations on the timber harvesting land base that are not incorporated into volume estimates.

For the Cranbrook TSA, unsalvaged losses were estimated to be 77 241 cubic metres per year. Where possible, the estimates attributable to each agent were based on long term average losses adjusted for any projected salvage of the affected volume. District staff confirmed the estimates are reasonable, although they were uncertain about the assumption that VDYP projections account for endemic armillaria losses. A high incidence of armillaria root-rot pockets have been found in mature stands on about 6000 hectares located within the timber harvesting land base. Annual mortality losses are estimated to occur on about 2 percent of this area. Assuming an average stand volume of 165 cubic metres per year for these types of stands, simplistically the estimated loss is about 19 786 cubic metres per year. A sensitivity analysis showed that if annual unsalvaged losses for existing stands were increased by this amount (for the first 70 years), there was no impact on the short- and long-term timber supply, but the decline to the mid-term level occurred earlier. The sensitivity analysis assumptions were predicated on the assumption that the TIPSY OAFs will account for future losses in regenerated stands.

In consideration of the information, I am not convinced that armillaria losses are totally unaccounted for in the volume projections in VDYP for two reasons: (1) field sampling data for VDYP would have included some of these losses, and (2) the recent inventory audit did not detect significant projected volume discrepancies.

I note the estimate of unsalvaged losses accounts for a significant amount of volume, almost 10 percent of base case projection. Over the mid to long term, unsalvaged losses should decline as more of the timber harvesting land base is roaded and stands are converted to younger age classes. For this determination, I accept that the figures used in the analysis constitute the best available information and adequately account for unsalvaged losses. I encourage district staff to continue to monitor trends such that any additional information can be incorporated into future timber supply analyses.

Reasons for decision

In reaching my AAC determination for the Cranbrook TSA, I have considered all of the factors presented above and have reasoned as follows.

In the 1999 timber supply analysis, the initial base case harvest level of 838 000 cubic metres per year was maintained for 13 decades before declining by 10-percent to 754 000 cubic metres per year. This lower level was projected from decades 14 to 16, after which the steady long-term harvest level of 883 000 cubic metres per year was reached. In determining this AAC, I have identified many factors that indicate that the timber supply may be more or may be less than the level projected in the base case. Generally some of these factors can be quantified and their impacts assessed with some reliability. Other factors may influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at the time of this determination.

In determining the AAC for the Cranbrook TSA, the following factors may indicate an overestimation in the projected timber supply.

- *physical and economic operability* - after a field and office review of operability, I find there is insufficient evidence to warrant a reduction of the operable land base based on lack of performance in steeper slopes and higher elevations. Nonetheless, I acknowledge there is some uncertainty on about 5 percent of the timber harvesting land base that is generally characterized as being difficult terrain on which to operate. I note that the magnitude of the uncertainty does not create a risk to the short-term timber supply but could represent a risk for mid- to long-term timber supplies.
- *existing roads* - about 540 hectares for existing roads, trails and landings were not mapped at the time of the timber supply analysis. This area represents a small overestimation of the timber harvesting land base.
- *estimate of existing stand volumes* - partial harvesting has occurred on about 24 900 hectares. However, an adjustment was not applied in the analysis to reflect the reduced stand volumes remaining on these areas. This results in an overestimation of about 2.8 percent of the total existing stand volumes, which may affect timber supply projections.
- *estimate of regenerating stand volumes* - due to armillaria root disease, it is possible that a higher operational adjustment factor (OAF) is required when projecting stand volumes for regenerated stands. Staff suggested an additional OAF of 2.8 percent. Also, there is uncertainty as to whether the current growth and yield tools for projecting future volumes for stands on about 20 percent of the timber harvesting land base adequately accounts for uneven-aged management, disease and insects, and either very low- or high-density stands. This uncertainty results in a potential overestimation of future stand volumes and is expected to primarily impact the mid- to long-term timber supply.

- *not-satisfactorily-restocked areas* - a reduction of about 720 hectares should have been applied to the timber harvesting land base to account for NSR which is actually inoperable. I have asked staff to examine this area to determine its future potential and appropriate contribution to the timber harvesting land base in the long term.
- *silvicultural systems* - seed trees which may not be recovered after harvesting represent a potential overestimation of existing stand volumes of about 0.8 percent.
- *Identified Wildlife Management Strategy* - consistent with provincial policy, I am accounting for up to a 1-percent timber supply impact expected for implementation of IWMS.
- *landscape-level biodiversity* - regional landscape unit planning strategies (now included in the pending KBLUP HLP), are considered a better definition of current practice for biodiversity emphasis options (BEOs) assigned to each landscape units in the TSA. Although it does not impact the short term timber supply, it does shift the timing of the decline from 13 decades to 5 decades from now.

I have identified the following factors as possible indicators of an underestimation in the projected timber supply.

- *environmentally sensitive areas* (ESAs) - reviewing and comparing sensitive soil designations to terrain stability mapping (a more refined method of measuring soil sensitivity) shows that the amount of area deducted from the timber harvesting land base for sensitive soils was overestimated. I consider this to represent up to a 1-percent underestimation of the timber harvesting land base.
- *Christmas tree permit areas* - about 432 hectares of expired permit area, which were not included in the timber harvesting land base, now contribute to the timber supply.
- *problem forest types* - about 11 350 hectares of excluded stands—on slopes less than 40 percent, with moderate overstocking (between 5000 and 10 000 stems per hectare) and with heights between 13 metres and 19.5 metres—meet the criteria for postwood operations. Harvesting and rehabilitation of these sites will improve habitat quality and biodiversity, as well as increase future site productivity and contribute to timber supply. An annual harvest rate could be about 380 hectares if rehabilitated over 30 years, which I have discussed in more detail below.
- *fire-maintained ecosystem restoration* - in addition to the 95 495 hectares of FMER areas included in the timber harvesting land base, an additional 6863 hectares are being managed under the FMER program to achieve KBLUP goals for fire-maintained ecosystems. This area supports a rehabilitation goal of about 230 hectares per year over 30 years, which I have discussed below.

I am also mindful that concern was expressed about the relative oldest first harvest sequencing rule applied in the analysis, as actual harvesting operations seem to more randomly harvest a variety of ages. While I understand this concern, I believe that harvesting is not likely to be truly random either, as stands are generally selected for harvest based on a variety of factors such as availability and stand volume. Therefore harvesting more likely trends towards harvesting the relatively older, higher volume stands

first. On the other hand, harvesting operations are striving to utilize mature but not necessarily the oldest lodgepole pine stands which have been attacked by mountain pine beetle. Therefore, actual harvesting priority is likely somewhere between truly random and the relative oldest-first assumed in the analysis. In addition, I reviewed two other factors, recreation areas and ungulate winter range areas, where forest cover constraints vary in actual practice compared with the assumptions in the analysis. When examined individually (the harvest sequence rule, and the forest cover constraints applied in the recreation and ungulate winter range areas), each factor does not indicate a potential impact on the short-term timber supply. However, I reviewed their implications when analyzed with changes in other factors as discussed below.

Generally I consider the base case timber supply to be reasonably stable as shown in the analysis and the numerous sensitivity analyses conducted and documented during the review. All of the downward influences and areas of uncertainty when considered on their own merits do not provide sufficient cause to warrant a reduction of the AAC at this time. However, I was concerned that when the factors are analyzed in combination they may impact the short-term timber supply.

With this in mind, I requested a combined sensitivity analysis that included the following: application of the Regional Landscape Unit Planning Strategy - BEOs; forest cover constraints for the moderate recreation zone replaced with the same constraints as applied in IRM zone; adjacency and green-up constraints applied in the ungulate winter range zone; application of a random-aged priority rule; a 1-percent reduction applied to timber harvesting land base to account for IWMS; a reduction of 0.8 percent (720 hectares) to account for inoperable NSR; a volume reduction of 0.8 percent to account for unrecovered seed trees; an additional 2.8 percent OAF 1 reduction to account for residual volumes left on partially harvested areas; and an additional 2.8 percent OAF 2 reduction to account for higher losses due to armillaria. The results of this sensitivity analysis indicate that the base case harvest level can be maintained for 20 years before starting a series of declines to a long-term harvest level of 776 000 cubic metres per year.

I believe that this combined sensitivity analysis provides a realistic and useful assessment of the impact on timber supply from the constraints discussed and expected to act on the timber harvesting land base over the next few years. The results also illustrate that the short-term timber supply in the Cranbrook TSA remains reasonably stable despite the additional constraints on the timber supply.

Having considered these factors, I will now discuss in more detail the two factors (as noted above) that represent a quantified upward influence on timber supply.

In the analysis, portions of stands defined as problem forest types—about 21 700 hectares—were deducted from the timber harvesting land base. A recent inventory study of the problem forest types showed that about one-half, or 11 350 hectares of these stands—on slopes less than 40 percent, with moderate overstocking (between 5000 and 10 000 stems per hectare) and with heights between 13 metres and 19.5 metres—meet the criteria for postwood or pulpwood operations. Harvesting and rehabilitation of these sites could improve habitat quality and biodiversity, as well as increase overall productivity of the TSA. I believe it is reasonable to adjust the harvest level to facilitate this type of

rehabilitation activity. In determining an appropriate harvest level, I will specify that the increased timber supply be partitioned to ensure that any the incremental volume is linked to this problem forest type. Of the larger area of 21 700 hectares as previously discussed, I consider that the estimated 11 350 hectares is a reasonable assessment, and perhaps even an underestimation, of the full amount of area covered with smaller but merchantable timber.

These stands generally have a lower than average volume of about 80 cubic metres per hectare at a 12.5-centimetre dbh utilization standard. Given this, an annual harvest level of about 30 000 cubic metres could be maintained over a 30 year period. I am confident that a higher harvest level can be achieved and ultimately benefit long-term productivity of the TSA. However, in determining an appropriate harvest rate, district staff advise me that due to lower merchantability on these stands, it is difficult to determine an accurate merchantable volume that meets current utilization and grade standards. To address this concern, another approach to setting a harvest level is to establish a harvest rate based on a projected area to be harvested each year. If these stands were rehabilitated over 30 years, the annual area harvested would be about 380 hectares per year, which following reforestation would result in a managed sawlog stand in about 70–80 years and lead to an improved long-term timber supply. Once logged and replaced with better growing stands, these areas will make a greater contribution to timber supply and enhance biodiversity in the long term.

The other factor in my considerations is government's commitment to achieving the KBLUP goals for managing forest encroachment in fire-maintained ecosystems. Staff identified an additional 6863 hectares of non-timber harvesting land base that should be converted to open range and open forest. These areas have very low volumes per hectare; nonetheless, it is expected that some merchantable volume will be harvested. Staff estimate that merchantable volumes range from 10 to 50 cubic metres per hectare, for an overall average of about 13 cubic metres per hectare. Based on this volume estimate, the additional 6863 hectares could yield about 3000 cubic metres per year, and facilitate the annual restoration and conversion of about 230 hectares to open forest and open range over the next 30 years.

Finally, there is an outstanding concern regarding the aging of the non-contributing stands. In reviewing timber supply forecasts, I agree that it is unreasonable to assume that all non-contributing stands will age indefinitely. However, sensitivity analysis results indicate that short-term timber supply in the Cranbrook TSA is not impacted by uncertainty around this factor. At a provincial level I will seek to resolve this matter and hopefully develop new modeling techniques which can be applied in the next round of TSA and TFL analyses. Any necessary adjustments will be made in future determinations on the basis of these expected new projections.

I am confident that the base case forecast, which reflects the conventional timber harvesting land base, is reasonably stable in the short term given our current forest management assumptions. This provides me with assurance that the additional land base identified for problem forest types and fire-maintained ecosystem restoration can be considered as additional to that supporting the base case harvest level. The problem forest

areas, once harvested and regenerated will result in improvements in long-term productivity and hence in the overall timber supply for the Cranbrook TSA.

Forest management for these two areas is important and staff expect that in the course of their management and rehabilitation, some merchantable volume will be harvested As such I must consider this volume in this AAC determination. However, due to the low merchantability of these two areas, estimating recoverable volumes is difficult and hence an appropriate harvest level that may be achieved over the 30 years is equally problematic. One approach to this problem is to set an annual harvest area for these two identified areas only. However, as I am compelled to set one AAC level for the TSA, I must establish a harvest level expressed as a volume per year for the entire TSA. To assist me with determining the expected annual volume contribution attributable to these two areas, district staff estimate an annual volume of about 30 000 cubic metres for the problem forest type areas, and about 3000 cubic metres for the fire-maintained ecosystem restoration areas.

In summary, apart from removing the volume associated with allocated woodlots from the current AAC, I am maintaining the harvest level for the conventional land base. The woodlot volume removal was reflected in the base case initial harvest level of 838 000 cubic metres per year. In addition, I am providing for an additional harvest level for the rehabilitation and restoration of non-conventional areas. Given the information provided by staff, I find it reasonable to increased the harvest level (as forecast in the base case) by 33 000 cubic metres per year. However, to reduce the risk from uncertainty regarding the volume estimates for these two non-conventional areas (as stated below in "Determination"), for the additional harvest level I have established a partition: an annual harvest area of 380 hectares per year for problem forest types; and an annual harvest area of 230 hectares per year for fire-maintained ecosystem restoration areas.

With respect to the partition, I request that staff administer the harvesting level by area. I also ask district staff to monitor the harvesting performance in these stands during the period for which this determination is in effect, and in particular whether the partitioned harvest level is attained. I note that in a future determination I may consider it more appropriate to exclude these stands from contributing to the timber supply—and adjust the projected harvest levels on this account—if harvest in the partitioned types does not appear to be operationally attainable.

Determination

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects the socio-economic objectives of the Crown for the area, that ensures longer-term integrated resource management objectives can be met, and that reflects current management practices can best be achieved in the Cranbrook TSA at this time by establishing an AAC of 871 000 cubic metres. Of this total AAC, 838 000 cubic metres is to be harvested from the timber harvesting land base as described and included in the current analysis, and I expect the remaining AAC to be administered as a partition to an annual harvest area as follows:

- 380 hectares per year for problem forest types (see definition below), and
- 230 hectares per year for fire-maintained ecosystem restoration (see definition below).

This determination excludes all woodlot licences issued at this time. This determination comes into effect on January 1, 2001 and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Partition definitions

***Problem forest types partition*:** leading-lodgepole pine stands that are older than 40 years, less than 19.5 metres tall, and at least 5000 stems per hectare are between 2.5 centimetres to 12.5 centimetres diameter (measured at breast height).

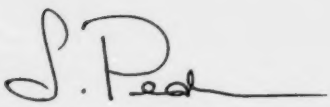
Fire-maintained ecosystem restoration (FMER) partition: areas classified as FMER open range or FMER open forest as per the "synthesized ecosystem management units" in the *Cranbrook Forest District Fire Maintained Ecosystem Adjustment Strategy, March 1998.* These are on sites with low timber growing potential as per the criteria in Table A-11 on page 117 of the *Cranbrook Timber Supply Area Analysis Report, December 1999*, on non-productive or non-commercial sites as per the forest inventory, or on existing open range sites as classified on the forest inventory.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the following list of tasks and studies that I have mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects depends on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Cranbrook TSA. I recommend that district staff:

- evaluate and implement strategies for harvesting of difficult terrain, if the areas are to continue to contribute to the timber supply;
- review previously excluded forest types, which have been included in the current timber harvesting land base. In particular examine the merchantability, terrain, location and economic factors that might limit harvesting of these types;

- continue landscape unit planning to ensure that future timber supply reviews can reflect more accurate timber supply impacts;
- include considerations for whitebark pine when determining retention areas for biodiversity;
- work with Timber Supply Branch staff to determine harvest sequence rules that more closely approximate current practice;
- confirm that appropriate areas of backlog NSR are being excluded from the timber harvesting land base;
- refine information regarding management of the recreation resource for future timber supply reviews; and
- monitor the level of harvesting within the partitions.



Larry Pedersen
Chief Forester

December 7, 2000

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

   (a) encourage maximum productivity of the forest and range resources in British Columbia;

   (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

   (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

   (d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

   (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: Summary of Public Input

File: 10100-01

JUL 26 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

Cranbrook Timber Supply Area
Timber Supply Review

Summary of Public Input

BC Ministry of Forests
Cranbrook Forest District
1902 Theatre Road
Cranbrook, BC
V1C 6H3

December, 2000

This is a summary of the public input received on the Timber Supply Review in the Cranbrook Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

Cranbrook Timber Supply Area

Background

As part of the review of timber supply in the Cranbrook Timber Supply Area (TSA), two opportunities were provided for public input. The first followed release of the Cranbrook Timber Supply Area *Data Package* and *Information Report* in January, 1999. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Cranbrook TSA. A 30-day review period, ending February 15, 1999, was provided for the public to comment on these documents.

On December 16, 1999, the British Columbia Forest Service released the *1999 Cranbrook Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the 60-day review period that ended February 18, 2000.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut for the Cranbrook TSA. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the Cranbrook Forest District office.

Public review process and response

Cranbrook District staff actively solicited public input on the Timber Supply Review in the Cranbrook TSA through the following actions:

- direct mail-out of about 50 copies of the *Information Report*, *Data Package*, *Analysis Report* and *Public Discussion Paper* to local governments and MLAs, First Nations, licensees, forest workers, environmental groups, ranchers, consultants and interested individuals in the Cranbrook TSA or adjacent timber supply areas.
- the *Data Package* and the *Cranbrook Timber Supply Area Analysis Reports* were available at the district office.
- meetings regarding the *Data Package* and/or the *Analysis Report* were held with representatives from First Nations, the forest industry and other interest groups, as well as with the local MLA and individuals.
- copies of the documents were made available to the local media, and interviews were conducted with reporters from the Cranbrook newspaper and East Kootenay radio.
- newspaper advertisements were placed, advising of the availability of the documents for review by the public.
- telephone contact with various individuals and organizations, providing further information if needed and encouraging them to provide input.

As Table 1 shows, about 16 individuals attended meetings or information sessions. The Cranbrook Forest District also received six written submissions on the *Data Package* and 11 submissions on the *Analysis Report* (see Appendix 1). In addition, three submissions were received just prior to release of the *Analysis Report*.

Participants (#)	Date
Elected officials	
MLA (1)	Jan. 12/99 & Dec. 16/99
Interest groups	
East Kootenay Environmental Society (4 & 1)	Jan. 22/99 & Jan. 31/00
Forest industry	
Various companies (4)	July 14/99
First Nations	
Ktunaxa Kinbasket Tribal Council (3 & 3)	Jan. 12/99 & Feb. 10/00

Table 1: Participation in public information activities

Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Cranbrook TSA is summarized under the following headings:

- Data Package (and Information Report)
- Timber Supply Area Analysis Report (and Public Discussion Paper)
- Other comments

Data Package

Land base factors

Three submissions comment on the definition of the operable land base. The East Kootenay Environmental Society (EKES) expresses the opinion that given the recent downturn in markets, operability should be reduced, while Crestbrook Forest Industries (CFI) maintains the exclusion of steeper slopes is inappropriate as the company has harvested these areas over the past five years.

Four submissions comment on the area reductions for Environmentally Sensitive Areas (ESAs). EKES says the reductions used for community and domestic watersheds should also be applied to regionally significant fisheries watersheds, such as the Wigwam and St. Mary's rivers. CFI says the 100 per cent reduction for areas classified with extremely fragile or unstable soils is excessive; the company recommends a 70-per cent reduction based on their review of terrain hazard assessments. The Interior Lumber Manufacturers' Association (ILMA) requests clarification of how double-counting will be avoided, particularly in watersheds. The Ministry of Environment, Lands and Parks (MELP) submission notes that ESA netdowns are incomplete as most drainages have not been assessed for soils, and wildlife netdowns will occur as part of landscape planning.

Three submissions comment on specific excluded forest types. EKES maintains the definition of parkland needs to be expanded and that areas containing whitebark pine are not to be harvested in Caribou Management Areas. The ILMA requests additional information on the areas impacted and evidence that they're not currently being utilized. CFI questions the removal of older cedar-hemlock and balsam-leading types. The company says some of these are productive sites and can be converted during high pulp markets.

Four submissions comment on problem forest types. EKES expresses the opinion that these types are insufficiently accounted for, since the forest industry often chooses to avoid harvesting them. The ILMA and CFI request the rationale used to determine these reductions, and MELP notes that extended rotations are viewed as a way to include these stands in the timber harvesting land base.

CFI and the ILMA question the reductions used to account for past and future roads, trails and landings. CFI says the reductions are excessive, and provides details. The EKES submission says an additional reduction is necessary since estimates for roads are based on Forest Practices Code requirements, but rights-of-way often exceed these widths due to terrain or WCB requirements.

Cranbrook Timber Supply Area

Existing forest inventory
The submission from EKES says since the recent inventory audit found 5.8 per cent less volume per hectare than existing inventories indicate, this should be reflected in the timber supply analysis.

Expected rate of growth
The EKES submission questions whether the lower volumes for future stands in NDT4 are properly accounted for, and notes the need for a sensitivity analysis to examine the effect of global warming on annual growth in the dry subzones of the Cranbrook TSA. The ILMA says it is unnecessary to arbitrarily establish an 1800-metre elevation break to reflect differences in productivity, as this is already accounted in the site index process and the use of operational adjustment factors. MELP expresses the opinion that upward pressure on timber supply in managed forest areas will result from better than expected future growth.

Regarding the effect of Armillaria root disease on future growth, MELP says the yield reduction used is too high and EKES says loss estimates are very conservative. The ILMA questions how the reduction was applied and whether it applies only to species, site and ages where Armillaria may logically be found.

Minimum harvestable age
The EKES submission says the use of the three criteria to determine minimum harvestable age is reasonable, but culmination age should be used for all species. The society says increasing rotation ages maximizes long-term volumes and increases wildlife habitat retention. The ILMA requests rationales for the values and process used to determine minimum harvestable ages. CFI says the minimum average diameters are much larger than needed for an economic operation and the requirement for non-pine species to reach 95 per cent of maximum annual growth may unnecessarily restrict timber flow.

Forest regeneration
CFI says the three-year regeneration delay for artificial regeneration is high considering that one-year-old seedlings are planted. The company also questions the reductions for not-satisfactorily-restocked (NSR) areas and several other regeneration assumptions in Table 17 of the *Data Package*.

Utilization standards
EKES notes that the forest industry has accepted reduced utilization standards as a result of the Forest Action Plan and since these are being implemented, they should be reflected as a timber supply netdown.

Forest cover requirements
Three submissions raise questions about forest cover requirements, particularly with regard to green-up heights and to the application of these requirements to forests in the Fire Maintained Ecosystem Restoration (FMER) areas.

Visually sensitive areas
CFI questions how the classifications for visually sensitive areas compare to TSR1, noting there should be a significant reduction to achieve the two per cent buyback directed by the chief forester. The ILMA questions the use of slope in relation to visual quality objectives, and MELP asks for information on the areas considered for retention.

Domestic and community watersheds
CFI and the ILMA note that "domestic watersheds" not used for human consumption should not be modelled under watershed guidelines. CFI questions in detail the use of a nine-metre green-up requirement and states that the majority of domestic watersheds that may impact timber supply are larger than 500 hectares and so a 35 per cent equivalent clearcut area should be used to be consistent with the Kootenay Boundary Land Use Plan (KBLUP) guidelines.

The EKES submission raises a number of concerns, including whether riparian reserves above the intakes of domestic watershed creeks were modelled as required by the KBLUP, the fact that public concerns in community watersheds such as Kimberley were not addressed, and the need to increase green-up heights as a result of recent research in the Nelson Forest Region. The society also says the maximum percentage of area less than green-up should be reduced to 20 per cent for community watersheds and 25 per cent for other domestic watersheds.

Riparian habitat

EKES says riparian management zones are necessarily wider than Forest Practices Code minimum requirements in many areas and this should be modelled more accurately. The ILMA requests further clarification of retention values and timber supply impacts. CFI says the retention factors must be revised because they are considerably higher than what is being achieved in the field, due to mountain pine beetle attacks, the predominance of pure lodgepole pine types, and the blowdown potential of spruce-balsam types.

Wildlife

The EKES submission notes that, as indicated in the KBLUP, cover requirements for caribou are to apply to the operable land base, not the forested land base. The ILMA requests at least a series of sensitivity analyses around feasible caribou management rules, given the lack of legal standing of the KBLUP and the recent findings of the administrative review in the Kootenay Lake Forest District.

With regard to ungulate winter range, the ILMA questions what assumptions are used compared to upcoming forest development plan requirements, and how minimum ages and percentages are determined (Table 20d). The MELP submission says NDT4 guidelines are standard in open forest and open range areas, while KBLUP guidelines apply elsewhere in areas with wintering wildlife. CFI is of the opinion that current cover requirements will result in continued forest encroachment, and instead proposes an approach that ensures a portion of the forest is always in age class 1 (via continual harvesting) to provide a food source, with less restrictive cover requirements elsewhere.

The MELP submission details the wide diversity of wildlife in the Cranbrook TSA, and notes that several concerns were not addressed (e.g., grizzly bear habitats, old growth management areas). MELP says this will occur during landscape planning and should be accounted for in the analysis.

Landscape-level biodiversity

EKES is of the opinion that the draft biodiversity emphasis options should be used in the timber supply analysis as they best represent current practice. The society says much of the Cranbrook TSA is in deficit in relation to biodiversity targets and the need to recruit mature and old forests must be reflected in the base case. A sensitivity analysis on immediate implementation of the old-seral requirement for low emphasis biodiversity variants is recommended; the society says the three-rotation delay is unreasonable and represents an unacceptable threat to biodiversity. EKES also notes that minimum retention area percentages for old-seral appear to be incorrect (Table 20a) and that modelling underestimates the presence of early seral since roads are removed from the timber harvesting land base.

CFI notes that the mature forest requirement is not to be applied in NDT2, and suggests its inclusion in NDT3 be tested in a sensitivity analysis to determine if it constrains timber supply. The ILMA requests further information and expresses the opinion that KBLUP guidelines should not apply as the plan has no legal standing. MELP expresses the opinion that mature and old requirements can be met on the operable land base if harvesting is allowed

through partial cutting and by considering other reserved areas.

Stand-level biodiversity
EKES is of the opinion that the 3.9 per cent volume reduction to account for residual volumes in cutblocks (usually for wildlife tree patches or WTPs) is insufficient and does not adequately reflect current management. CFI and the ILMA say 3.9 per cent is considerably higher than expected, based on the impact analysis done by the chief forester. CFI also says the reductions in open forest and open range units are significant; since these areas will eventually contribute to mature and old requirements, the company asks how this will be modelled to avoid double-counting.

MELP is of the opinion that the sample used to determine the residual volume reductions does not reflect current practice, and that part of the residual volumes should be attributed to other factors than WTPs. MELP notes that volume retentions are not permanent reductions, merely a rotation delay.

Non-recoverable losses
EKES maintains that allowances for NRLs should be significantly increased to account for the potential increased frequency of fire, insect infestations and disease due to global warming. CFI says the volume may be high due to increased salvage logging, and suggests NRLs should decline over time as the TSA is fully roaded. The MELP submission notes the need to distinguish small areas, killed by natural processes, that should not be salvaged due to cost and impact on biodiversity values.

Timber Supply Area Analysis Report

Land base factors
The submissions from EKES and MELP express the opinion that operability lines are overly optimistic, noting a backlog of steep, high elevation sites where licensees avoid harvesting. CFI states its disagreement with the 100 per cent netdown on steeper slopes, as there is proven performance in these areas.

EKES questions the 10 metre cut-off for defining low productivity sites for lodgepole pine; the society says this is very liberal and does not reflect current practice.

CFI says the 100 per cent removal of areas classified with extremely fragile or unstable soils, or with severe regeneration problems may be excessively restrictive considering current harvesting and reforestation technology. The company says these netdowns should be validated prior to the next timber supply review.

Three submissions maintain that stands of whitebark pine should be excluded from harvesting, because there is no seed source for regeneration, the species is considered threatened across its range and it has high value for wildlife and traditional uses. CFI questions the removal of 13,000 hectares of high elevation parkland, particularly based on a biogeoclimatic variant line. The company also disagrees with the removal of older cedar-hemlock and balsam-leading stands, saying some of these are extremely productive and have been harvested.

EKES says additional netdowns for existing and future roads, trails and landings are needed to reflect current practices, based on their field observations that impacts often extend beyond the 20-metre right-of-way. CFI says the netdowns are excessive, citing major advances in cable harvesting and rehabilitation techniques, the trend to smaller landings, and

the fact that 20 metres reflects the right-of-way width not the actual construction width less tree crown overlap.

The City of Kimberley requests that all lands within the proposed Nature Park be removed from the timber harvesting land base.

Forest inventory factors
EKES says that, in recognition of the inaccuracy of inventory information, it is imprudent to accept the optimistic inventory assumptions in the base case. The MELP submission identifies several uncertainties that indicate a significant downward trend in available timber.

The Ktunaxa Kinbasket Tribal Council submission notes that stands do not have even tree distribution and this has led to consistent overestimates of volume for many years. The Tribal Council says there's particular uncertainty about timber volume estimates at high elevations and that productivity of these sites will be directly related to short- and long-term climatic trends. CFI is of the opinion that any overestimation of volumes in high elevation stands would have been identified in the inventory audit.

Expected rate of growth
With regard to high elevation growth rates, CFI notes that the results of the Old Growth Site Index study were not included in the analysis but could easily compensate for any potential overestimate of high elevation productivity. The Kimberley Community Forest Working Group express the opinion that productivity estimates are overly optimistic in light of the impacts of global climate change (warmer winters, increased drought, greater uncertainty about negative climatic events).

EKES says the minimum harvestable age must be at least 95 per cent of the age at which maximum annual growth occurs. The society says harvest of younger, high volume stands should only be approved if needed to achieve desired age and patch objectives. CFI questions the minimum harvestable age for lodgepole pine on steep, poorer sites, and recommends it be lowered to a biologically achievable number considering mountain pine beetle infestations.

Not-satisfactorily-restocked areas
CFI says if backlog NSR areas are indeed productive forest land, they will reforest through normal successional processes over time and should be re-introduced to the timber supply analysis at an extended time, such as 30 years.

Green-up requirements
CFI says the use of green-up heights other than two metres is inconsistent with the KBLUP. The company particularly expresses concern about the use of a three-metre green-up in moderate recreation resource emphasis areas, saying this contradicts the intent of the KBLUP. With regard to watersheds, CFI says the nine-metre green-up height does not reflect required practice and notes the regional Forest Service staff have recognized that stands contribute to hydrologic green-up long before reaching nine metres and has instructed other TSAs to use six metres. CFI also questions green-up ages used in the analysis, based on information from the Invermere TSA Enhanced Forestry Management Pilot Project.

Wildlife and riparian areas
CFI says it is alarmed that the land base reduction for riparian management areas is 7.7 per cent, as this is more than double the impact estimated in the chief forester's Forest Practices Code impact assessment. The company also questions the 50 per cent retention in management zones, given that almost 50 per cent of the Cranbrook TSA is covered by lodgepole pine.

The Ktunaxa Kinbasket Tribal Council says that since caribou has been designated an identified wildlife species requiring special management provisions, it may be necessary to add areas of protected old growth and further restrict harvesting in other areas.

Biodiversity

EKES and MELP maintain that modelling old growth in the non-contributing land base as aging forever is inconsistent with natural fire and disease cycles. EKES says a further netdown is needed to assure biodiversity requirements are met in the future. EKES and MELP say that since over two-thirds of the landscape units in the TSA are in deficit with regard to mature and old components, there is a need to restrict mature and old removal until a spatial model can demonstrate maintenance of these values with appropriate patch size over time. EKES also expresses the opinion that continuing to model biodiversity emphasis based on 10/45/45 is inappropriate.

CFI expresses concern that the application of biodiversity requirements may impact the timber supply in the short and medium term. The company is also concerned with the 3.9 per cent reduction to timber yields to account for residual volumes left in harvested areas to meet stand level biodiversity objectives. The company says the chief forester should direct the district to achieve the objectives within the prescribed impacts outlined in the chief forester's 1996 Forest Practices Code impact assessment.

The Ktunaxa Kinbasket Tribal Council says the conclusion that any older stands not needed to meet biodiversity requirements should be harvested in the next two decades is too big a risk; any major natural events in the remaining old growth would leave no older reserves as a contingency.

Oldest-first schedule

Two submissions question the use of the oldest-first harvest schedule. EKES says the schedule should be based on random harvest ages above the minimum harvestable age, which more closely reflects current management.

Non-recoverable losses

Three submissions express concerns that the estimates for losses may be insufficient, due to the dominance of fire-maintained ecosystems, the impacts of climate change and the extent and speed of projected beetle infestations. EKES says recent blowdown events emphasize the need for further netdowns and that assumptions around the impacts of Armillaria root disease are insufficient.

Socio-economic impacts

Three submissions express the opinion that the analysis does not sufficiently consider changes in the social and economic drivers in the Cranbrook TSA. These changes include the transition from single resource-dependence to greater diversification (e.g., tourism investments) and increasing public concerns about viewscapes, recreational opportunities, and environmental values (water quality, biodiversity, wildlife habitat, etc.).

EKES says changes in social values should be reflected in the timber supply review as licensees are increasingly encountering resistance to management proposals on sites prioritized by communities for non-timber values. A consultant's submission says year-round back-country operations will potentially generate a higher return to the Crown than timber does.

Two other submissions are of the opinion that the forest industry remains a cornerstone of the local economy, and must be maintained in a healthy and productive state. Grizzly Peak Log Homes says a new direction is needed that puts greater emphasis on sorting the available timber

cut for the highest employment and economic success.

Other Comments

Many submissions commented on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

Timber Supply Review process
Two submissions say the lack of final criteria and quantitative information in the *Data Package* make it impossible to adequately provide input. CFI expresses disappointment that the comments they did make, which would have resulted in upward pressure on timber supply, were not incorporated into the final inputs for the analysis. CFI concludes the process is flawed and not intended to solicit meaningful input.

The MELP submission says the analysis does not incorporate all current practices or the best information available, nor does it reflect the most recent land-use decisions. EKES says the base case fails to adequately reflect what is happening on the ground and could lead to even greater environmental, social and economic impacts in the future. A consultant's submission says the analysis only works if one assumes the forest sector will continue to dominate land use and the politics of land use decisions into the distant future.

The Kimberley Community Forest Working Group say the resolution of land claims may have major implications on timber supply and should be examined in a sensitivity analysis. The group also says full-cost accounting should be used in the assessment of government revenues. The MELP submission maintains that the timber supply review process is only a wood fibre accounting process, where fish and wildlife issues are considered as impacts on harvest levels, but the converse is not considered.

EKES maintains it is appropriate to model all aspects of the KBLUP in the base case. The society says that, although KBLUP has not yet been declared a higher level plan, it is government policy and is being implemented. The ILMA submission says, given the current state of confusion over the status of the KBLUP, its lack of legal standing and the numerous conflicts with the Forest Practices Code, the analysis should focus on Code requirements only.

Harvest Levels
Four submissions express the opinion that the current AAC should be maintained, based on the analysis information and the importance of the forest industry. CFI is of the opinion the AAC could be increased to prevent an epidemic mountain pine beetle attack, given the preponderance of twilight and mature lodgepole pine.

The Kimberley Community Forest Working Group says the base case must be approached with great caution and must not close future options, such as increasing diversification in tenures (more woodlots and community forests). The group believes that within decades, forest planning will face a wall of spatially-related constraints and the lack of a spatially explicit plan is a key concern. The group says the willingness to consider local wishes (e.g., opposition to watershed logging) by reducing the AAC will go a long way in enabling solutions to current tensions between competing land uses.

Two submissions say the risk of data errors and the uncertainty of the future (e.g., climate change, disease, use of forest for other purposes, rapid world change) require the AAC be significantly reduced to a sustainable level with a healthy margin for error and unpredictability. Two other submissions identify a variety of downward pressures on

timber supply and recommend increasing the Forest Service Reserve to 15 per cent of the AAC to provide flexibility to deal with future uncertainties.

EKES is of the opinion that until a long-term harvest projection based on a spatial model is available, harvest levels must be sufficiently conservative to retain options for meeting other objectives. No reduction in AAC now would imply that impact assessments of the Forest Practices Code and the KBLUP that projected a 10 per cent harvest reduction are invalid. EKES says environmental accounts were consistently degraded throughout negotiations in order to lower what now appears to be non-existent impacts on timber supply.

Partition

Five submissions comment on the desirability of creating a partition and/or an AAC uplift for harvesting in the forage ecosystem enhancement or restoration areas in the NDT4. These submissions say harvesting must be speeded up to stop the encroachment of forests onto traditional wildlife winter ranges and recommend an increased AAC specifically for the NDT4, for exclusive use on open range/open forest areas.

EKES says that, along with the FMER areas, other marginal stands should be partitioned so licensees can demonstrate the wood is suitable for logging. The Ktunaxa Kinbasket Tribal Council says a partition of the NDT4 areas should be considered to facilitate innovative harvest techniques and ecological restoration projects to improve productivity; otherwise, expected productivity should be adjusted downward.

First Nations

The Ktunaxa Kinbasket Tribal Council notes that no analysis is presented regarding the potential impact of First Nations issues on the land available for harvesting. The Tribal Council says the chief forester should consider that after a treaty settlement, within the next five years, the Ktunaxa Nation will assume full control over a certain percentage of lands within their traditional territory. In addition, the Tribal Council says the ongoing identification of archaeological and cultural sites, as well as traditional use sites and medicinal and food plant gathering areas, will also remove land from the timber harvesting land base.

Submissions received by the Cranbrook Forest District

Submissions received on the Data Package

Government agencies
Ministry of Environment, Lands and Parks, Forest Ecosystem Specialist, Cranbrook

Industry
Interior Lumber Manufacturers' Association
Crestbrook Forest Industries (known as Tembec Industries Inc. effective October 1, 2000)
Grizzly Peak Log Homes

Interest groups
East Kootenay Environmental Society

Local government
Regional District of East Kootenay

Submissions received on the Timber Supply Analysis Report

First Nations
Ktunaxa Kinbasket Tribal Council

Government agencies
Ministry of Environment, Lands and Parks, Forest Ecosystem Specialist, Cranbrook

Industry
Crestbrook Forest Industries (known as Tembec Industries Inc. effective October 1, 2000)

Interest groups
East Kootenay Environmental Society
Kimberley Community Forest Working Group
Cranbrook and District Chamber of Commerce
East Kootenay Hunters' Association*
Rocky Mountain Trench Natural Resources Society*
Rocky Mountain Naturalists*

Local government
City of Kimberley
District of Sparwood

General public
Three individual submissions

*submissions received prior to release of the *Analysis Report*